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A REVISION OF THE GENUS *SPATHOLOBUS* (LEGUMINOSAE-PAPILIONOIDEAE)

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ABSTRACT

In the S. E. Asiatic genus *Spatholobus* 28 species are recognized, 6 of which are never described before: *S. albus*, *S. auricomus*, *S. auritus*, *S. hirsutus*, *S. multiflorus* and *S. viridis*. One variety (*S. ferrugineus* var. *acutus*) is also newly described. A key and full descriptions with plates and maps to illustrate the distribution are given.

ABSTRAK

Marga *Spatholobus* yang khas dari Asia Tenggara memiliki 28 jenis, 6 diantaranya yaitu *S. albus*, *S. auricomus*, *S. auritus*, *S. hirsutus*, *S. multiflorus* dan *S. viridis* belum pernah dipertelakan sebelumnya. Satu varietas (*S. ferrugineus* var. *acutus*) dipertelakan juga untuk pertama kalinya. Suatu kunci determinasi dan pertelaan lengkap disertai gambar dan peta penyebaran semua jenis disuguhkan.

ACKNOWLEDGEMENTS

This publication is the result of a remarkable case of cooperation afterwards. Completely independent (and initially unaware of it) we studied the genus *Spatholobus* as a subject of our M.Sc. theses. Harry Wiriadinata submitted his thesis early 1978. This thesis was based exclusively on material present in the Herbarium Bogoriense and covered the species of the Malesian area. The manuscript was typewritten in a few copies and temporarily deposited for future elaboration and publication. At the end of 1978 and unaware of this, Jeannette Ridder-Numan started a taxonomic monograph in Leiden, and heard only of the work already done when she had proposed so far with her studies, that a change of subject was considered out of question. Fortunately the results of both these studies differed only in minor details, and it was cordially agreed that a combination of the results would be an

excellent base for a joint publication and it was Drs. Robert Geesink's greatly acknowledged task to combine both these into a publishable manuscript. He was assisted by Dr. Max van Balgooy, who translated the general chapters of Wiriadinata's thesis for this purpose, for which all parties concerned are cordially grateful.

We are thankful to the Directors of the Rijksherbarium, Leiden and Herbarium Bogoriense, LBN respectively for their kind hospitality and facilities during our studies.

Drs. R. Geesink and Dr. Mien A. Rifai guided our studies and we feel much indebted to them. One of us (J. R. - N.) visited the herbaria at Kew, Paris and Utrecht and we are thankful to their Directors and to the Directors of the following herbaria, which sent material on loan: BR, CAL, C, E, FI, K, KLU, P, SAN, SAR, SING, U and US.

We are grateful to Prof. Dr. C. Kalkman, to Dr. Mien A. Rifai and to Dr. W. Vink who read our theses and the final manuscript critically and provided us with useful remarks. We thank Mr. Groeneveld and Mr. J. van Os for preparing the diagrams and the plates.

HISTORICAL INTRODUCTION

The genus *Spatholobus* was established by Hasskarl in 1842 with one species, *S. littoralis*. In 1846 Zollinger and Moritzzi described (the congeneric) *Drebbelia* with the different species *D. ferruginea*. Benthams (in Miquel, 1852) transferred *D. ferruginea* to *Spatholobus*, as well as some species, originally described under *Pongamia* and *Butea*. He combined *B. parviflora* and *B. sericophylla* as *S. roxburghii*, and transferred *B. gyrocarpa*, *B. acuminata* and *P. crassifolia* to *Spatholobus*, retaining their epithets. About *P. rosea* he only noted that it is 'not very much different from *S. acuminatus*' without sinking it into synonymy. Erroneously he spelled *Pongamia* as *Bugamia*, but it is obvious that he meant *Pongamia* because of the use of the abbreviation '*P. crassifolia*' in the same paragraph. Of these species Benthams gave also diagnoses, thereby validating the names from Wallich's Catalogue.

P. rosea mentioned by Benthams, was transferred to *Spatholobus* by Prain (1897-b). In the same article Prain described also some new species: *S. squamiger*, *S. listeri*, *S. riparius*, *S. merguensis* and *S. purpureus*. The latter was based on an unpublished name of Benthams, mentioned by Baker (1879). *S. squamiger* was proposed as a new name for *Butea acuminata* Kurz non Wall. (cit. Prain). Kurz (1876) however, did not mean to describe a new species. But in Prain's opinion the

notes of Kurz and his specimen 2596 (which is not cited by Kurz, but which Prain obviously found in the herbarium at Kew) differ from *S. acuminatus*. At most this is a misidentification of the mentioned specimen. *S. squamiger* can thus be regarded as a new species described by Prain.

Bentham did not use the old epithet 'parviflorus' in his new combination *S. roxburghii*. It is quite understandable that Bentham used another name because 'parviflorus' is not very suitable for a species with the largest flowers in *Spatholobus*. Kuntze (1891) made the necessary combination *S. parviflorus*. Hu (1924) most probably not aware of Kuntze's correct name, published this name also as a new combination.

Prain (1897 a) described four species: *S. bracteolatus*, *S. dubius*, *S. maingayi* and *S. ridleyi*, in the same article he indicated that there are 9 Malayan and one Tropical African species known. This African species, *S. africanus* Baker (1871) turned out to be *Leptoderris brachyptera* (Benth.) Dunn and not a *Spatholobus* (Hepper, 1958). Further he described *S. pottingeri* from India in 1898.

In 1903 Dunn described three species from material sent by Henry from Yunnan (S. China): *S. pulcher*, *S. suberectus* and *S. varians*.

Also from the mainland of Asia, Gagnepain (1911) published four new species: *S. balansae*, *S. harmandii*, *S. laoticus* and *S. spirei*.

In 1910 Elmer described *S. apoensis* and in 1919 he published *S. sanguineus* both from the Philippines.

In 1916 Merrill proposed two new species from Borneo: *S. affinis* and *S. oblongifolius*, and again in 1929 *S. latistipulus* and *S. platypterus*. In 1923 Merrill transferred *Derris palawanensis* Elmer (1913) to *Spatholobus* and at the same time reducing *S. philippinensis* Merrill (1918).

From the mainland of Asia, Craib (1927) described *S. compar*, *S. dimorphus* and *S. floribundus* and later *S. pallidus* (1928).

Ridley described also two species from Borneo: *S. strigillifer* in 1929 and *S. persicinus* in 1938.

More recently in 1958, Chun and T. Chen published a new species from China, *S. sinensis*.

MORPHOLOGY

VEGETATIVE PARTS

All species of *Spatholobus* are woody climbers with trifoliate leaves. Occasionally, some leaves have four leaflets, viz. 2 terminal leaflets, especially when the ultrajugal part (the part of the rachis) which is

defined as the axis of the leaf inclusive pulvinate base up to the petiolule of the terminal leaflet) apical from the insertion of the lateral leaflets is relatively short. The relative length of the ultrajugal part can be a discriminating character between species or groups of species. *S. oblongifolius* for instance has a very short ultrajugal part up to about $1/8$ of the total length of the rachis, *S. mainyayi* a comparatively long one, at least $1/3$ of the rachis length.

All species have stipules which are caducous in an early stage, except in *S. auritus*, *S. hirsutus* and *S. latistipulus*. The latter species has stipules which are asymmetric and about as broad as long. Usually the stipules are narrowly triangular with an acute or obtuse apex.

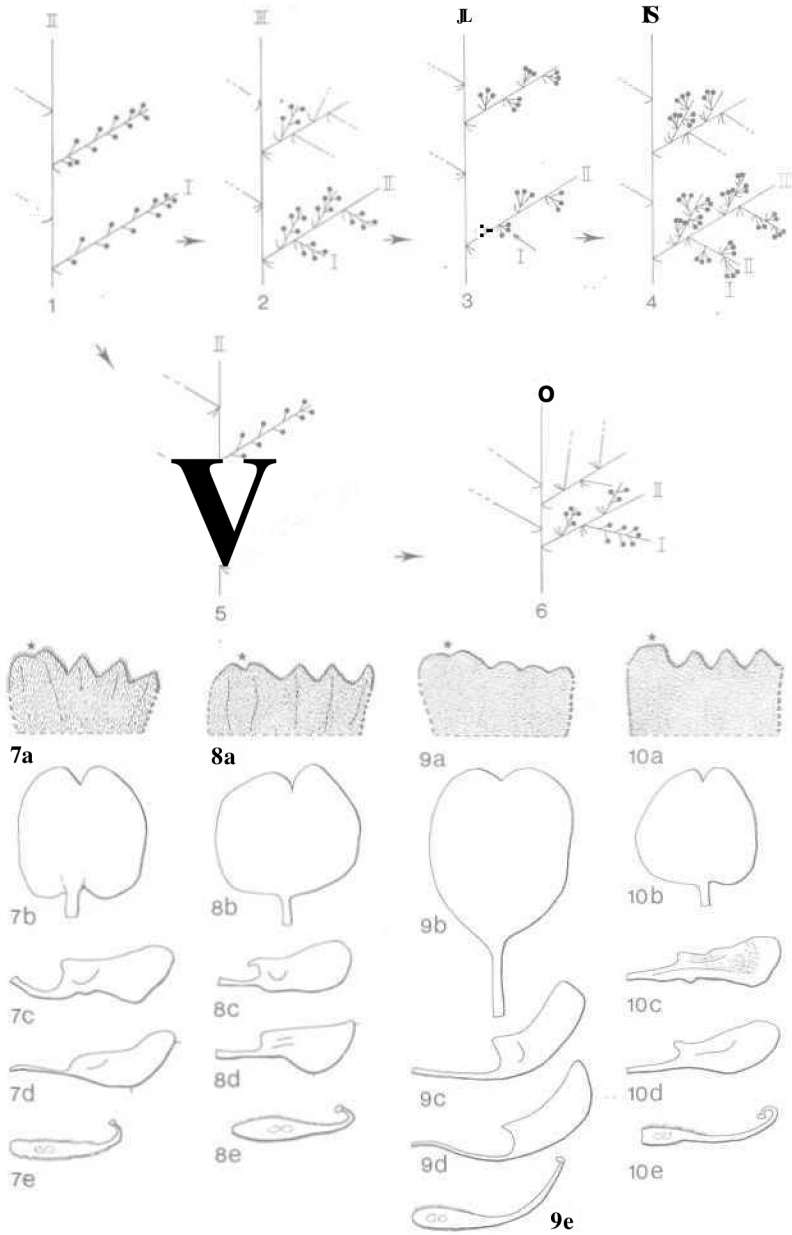
Stipellae are also present in all species, but usually not as early caducous as the stipules. Sometimes they are longer than the petiolules, in other species they are shorter.

The lateral leaflets are either more or less symmetric or asymmetric. There are two types of asymmetric: strongly asymmetric leaflets like those of *S. parviflorus* with sides which differ both in form and size, and slightly asymmetric leaflets, the sides of which differ in form (e.g. *S. persicius*) but only very slightly in size. In asymmetric leaflets the acroscopic side (the side pointed toward the apex of the leaflet) is always narrower than the basiscopic side.

Also the nervation provided useful characters. The main nerve can be raised (e.g. *S. harmandii*), or the main nerve and the secondary nerve can be raised (e.g. *S. oblongifolius*), or the main nerve secondary nerves and tertiary nerves are raised (e.g. *S. ferrugineus*). Most frequently the secondary nerves do not reach the margin, but they are curved towards the apex of the leaflets and terminate diffusely between the venation after deflection from the margin. Other species have submarginal arches formed by the secondary nerve. *S. ferrugineus* is the only species in which the secondary nerves terminate in the margin, there joining the marginal nerve.

INFLORESCENCE

The flowers are arranged in axillary or terminal panicles or pseudo-panicles. An average panicle of *Spatholobus* is composed of a main axis with several spirally arranged branches, which bear in their turn secondary branchings, the flower-bearing branches on which the flowers are arranged spirally as in a raceme. To describe the different types of



Piate A.

1 — 6, Schumi; of possible inflorescence development. 7. *S. virhlis* (A IU3isl-
8. *S. wvits* (S, 32OU-J), !). *S. awrittm* (Haniff 3703), 10. *S. kirtitius* (Endert 5162).
a, calyx, b. stamiavd, e. wing petal, d. lecl petal, c. pistil,

inflorescences the branchings of different order are designated by Roman numerals. The branch which bears the flowers is called I (this may also be a fascicle), and so further to the main axis. The main axis usually will be called III, but varies with the number of branchings. Again in the average panicle branch I has one bract, while branch II seems to originate from two collateral bracts. These two bracts look identical, but in many cases a second lateral branch sprouts from their axil.

In a pseudopanicle the flowers are arranged in fascicles and these in a panicle. A fascicle can be considered a shortened flower-bearing branch, branch I, in which the 2-4 flowers are each subtended by a bract. This shortened branch can either be a short peduncle with flowers at its apex (e.g. *S. littoralis*) or a wart with flowers (e.g. *S. ferrugineus*). Transitional stages between the former and the latter occur e.g. in *S. maingayi*. Both fascicle and flower-bearing branch originate from the axil or one bract. The difference between a short flower bearing branch and a fascicle is not clear-cut. The separation between panicles and pseudopanicle is thus rather gradual. They represent only different stages of reduction. A further stage of reduction is also possible the fascicles reduced to only one flower with its bract, arranged immediately on branch II instead of branch I. This is found e.g. in some species of the (remotely allied) genus *Millettia*. Here the distance between the solitary flowers is equal to the distance between (the homologous) fascicles in related species. Besides in some species with extremely reduced pseudoracemes a few nodes can be found with two flowers with three bracts, one of which is the bract to the fascicle. This step could be symbolized by an arrow between figs. 3 and 6 in plate A: I. This kind of reduction however is never found in *Spatholobus*.

A possible derivation of the type of inflorescences in *Spatholobus* is shown schematically in plate A: I. *S. bracteolatus* and *S. ridleyi* have a simple panicle (plate A.I: 1) with main axis (branch II) and lateral branches (I) subtended by one bract. *S. albus* and *S. harmandii* have similar panicles, but with two bracts at the base of the lateral branches I (plate. A.I: 5, 6). In other species the second bract is situated at the base of lateral branches II (plate A.I: 2, 3, 4). This second bract has a dormant axillary bud, but this is sometimes difficult to observe because of the indument. In all inflorescence types this bud develops occasionally. It can develop into a flower or even into a branch

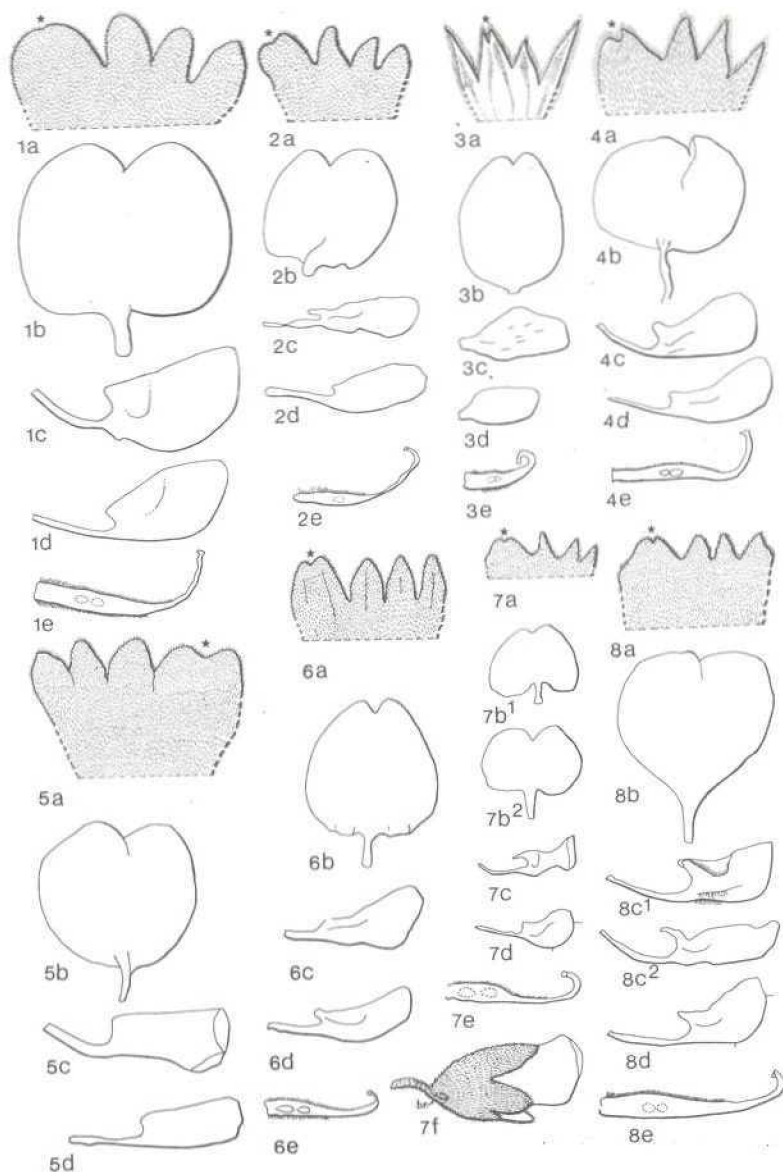


Plate B.

1. *S. acuminatus* (Lace 4723), 2. *S. acuminatus* (Kurz s.n., 17.3.1894), 3. *S. bracteolatus* (Kunstler 8079), 4. *S. crassifolius* (a. Wall 5913^M, b-e. Griffith 1826), 5. *S. pottingeri* (Balansa 3141), 6. *S. oblongifolius* (SAN 27454), 7. *S. gyrocarpus* (a-b¹, SAN 88852, b²-e. SAN 32504, f. Elmer 17560), 8. *S. ferrugineus* (a. Ridley s.n. 1915, c¹. Blume s.n., e. FRI 4116, others Mohd. Shah & Noor 2043). a. calyx, b, b¹, b². standard, c, c¹, c². wing petal, d. keel petal, e. pistil, f. flower showing bracteole.

of the same order as the branch develops from the adjacent bract. The presence of two collateral bracts in the inflorescences seems a general feature in the subtribe *Glycininae* (s.l.). The question whether this second bract belongs morphologically to branches II or III (in plate A.I: 2, 3, 4) or to branches I or II (in plate I: 5, 6) can better be studied in connection with other genera of this subtribe. The herbarium material of *Spatholobus* was not suitable to discern the phyllotaxis with reasonable certainty: usually the specimens lack sufficient vegetative leaves and in the inflorescence in one species a phyllotaxis of $1/2$, $1/3$ and $2/5$ were found, which must be due to invisible twisting in the drying procedure.

S. harmandii can show situation 5 and 6. In the latter case a new main axis (III) is assumed to have developed by reduction of vegetative leaves to bracts; axis III is thus vegetative in situation 5. The gradient from larger vegetative (trifoliolate) leaves through smaller trifoliolate and unifoliolate leaves is sometimes found in herbarium specimens. Transitions between small unifoliolate leaves and bracts are not (yet) observed.

Situations intermediate between 1 and 2 have not been found. We assume that one of the two bracts subtending branch II is derived from a reduced leaf and the other bract either belongs to branch II or III. By contraction the flower-bearing branches (I) reduce to fascicles (plate I:3). Intermediates between these stages are found e.g. in *S. maingayi*. Inflorescences 3 combined with 4 are found in *S. ferrugineus*.

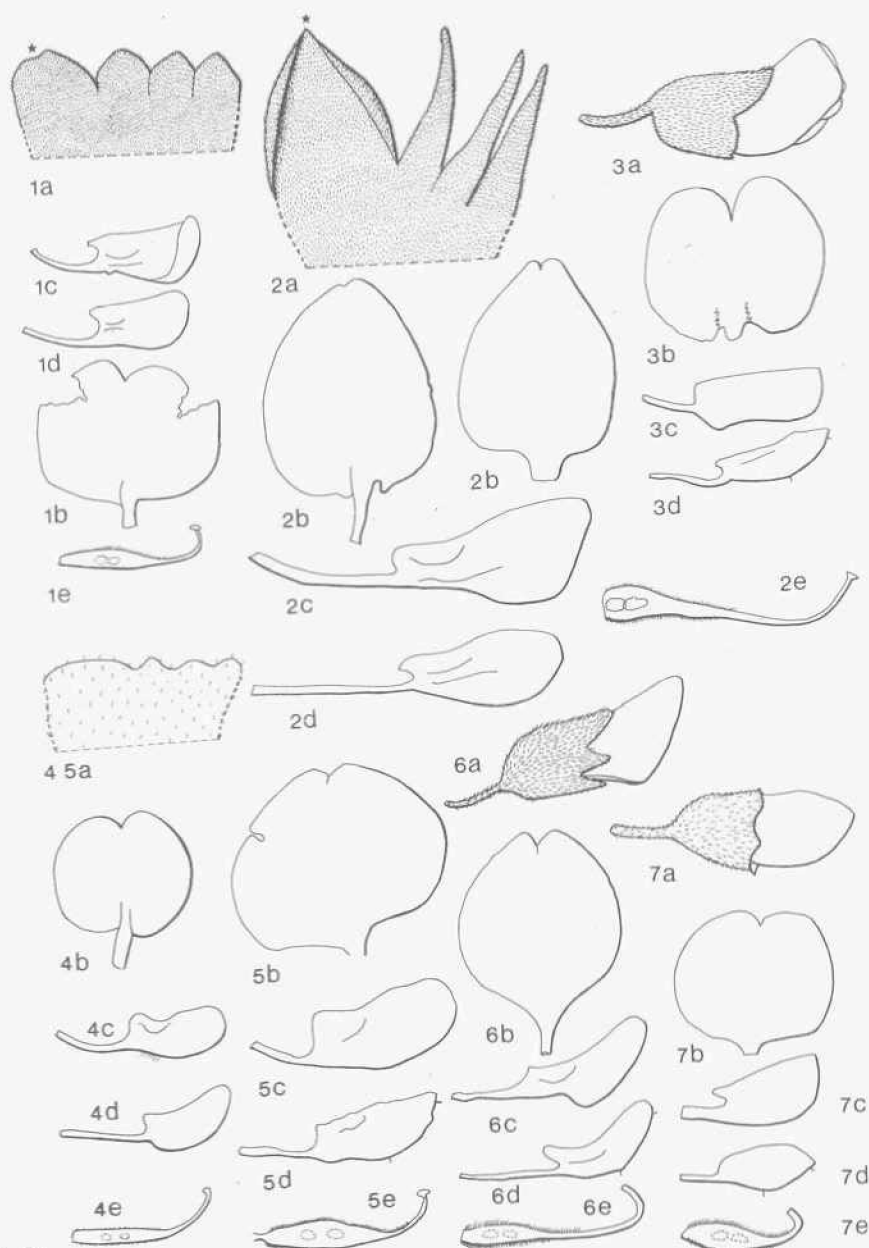
The bracts are often very early caducous, thereby thwarting the discernment of one or two bracts or even no bract at all. But in most cases a small scar is visible in between the indument on the place where the bract was situated.

Sometimes at the base of the main axis several scales are present, arranged in a more or less condensed spiral. There old bud scales occur in all types of inflorescences.

FLOWER

The species of *Spatholobus* have rather small papilionate flowers, the largest is about 1 cm long.

The calyx is campanulate. The length of the calyx lobes compared to the length of the calyx cup is different for each species or group of species. There are four calyx lobes: the vexillary (dorsal) one is composed of two lobes: it is about twice as broad as the other lobes and — in most species — its apex is emarginate.



Platte C.

1. *S. harmandii* (Collins 1635), 2. *S. parviflorus* (a, b¹, c. Haines 686, b². Geesink & Phengklai 6068, c, d. Williams & Stainton 8535), 3. *S. littoralis* (Backer 17061), 4. *S. mainyayi* (Ridley s.n. Jan. 1915), 5. *S. mainyayi* (Elmer 13300), 6. *S. macropterus* (Elmer 13063), 7. *S. latistipulus* (Elmer 21439) a. calyx & flower from aside, b, b¹, b². standard, c. wing petal, d. keel petal, e. pistil.

The standard is about as broad as long and is emarginate at its apex. There are no inflexed auricles or other callosities on the blade. When flowering the standard is not reflexed as is usual in many papilionate flowers. The keel petals are often interlocked by the wing petals by means of lateral pockets. The keel petals are usually slightly connate or adherent to each other along the ventral margin from about halfway up to the apex. Sometimes they are free, but still valvate. The wing petals are about as long as the keel petals, when longer they are imbricate at the apex thus enclosing the keel petals.

The stamens are diadelphous, with the vexillary stamen free. The other nine stamens are connate in a gutter like sheath which fits around the pistil. The stamens are different in length, alternately longer and shorter and also gradually slightly longer to the ventral side. The vexillary stamen is always the shortest. The length of the connate part of the stamens varies among the different species between about $1/4$ and $4/5$ of their total length. The anthers are either uniform and all fertile or alternately normal and reduced; the reduced ones are on the shorter filaments and probably sterile. If there is an alternation of reduced and normal anthers, the vexillary stamen bears a reduced anther. The length of the normal anthers is also characteristic for species.

The nectary is intrastaminal and surrounds the stipe. Mostly it is divided into 10 lobes, each of which is facing a stamen (e.g. *S. littoralis*). In *S. gyrocarpus*, a species with reduced anthers, the lobes of the nectary opposite to stamens with reduced anthers are reduced as well. *S. latistipulus*, however, has only 5 lobes, whereas the anthers are uniform. The nectary is indistinct in about half of the species. *S. pulcher* and *S. suberectus* both possess a nectary consisting of a ring which is open at the vexillary side.

The pistil is supported by a short stipe. The ovary gradually merges into the style, which is usually dorsally curved. The stigma is very small and capitate or flattened and oblique. In *S. bracteolatus* the stigmatic tissue is situated on the -not broadened- apex of the style, but this is only observed in very young buds. The apical part of the style and stigma lack any appendages. The ovary contains two ovules which may be attached near the base or the top or in the middle of the locule. The ovules sometimes overlap each other. Only the apical ovule develops into a seed. Exceptionally three ovules were found. *S. pulcher* is the only species which has as a rule 2-4 ovules per ovary.

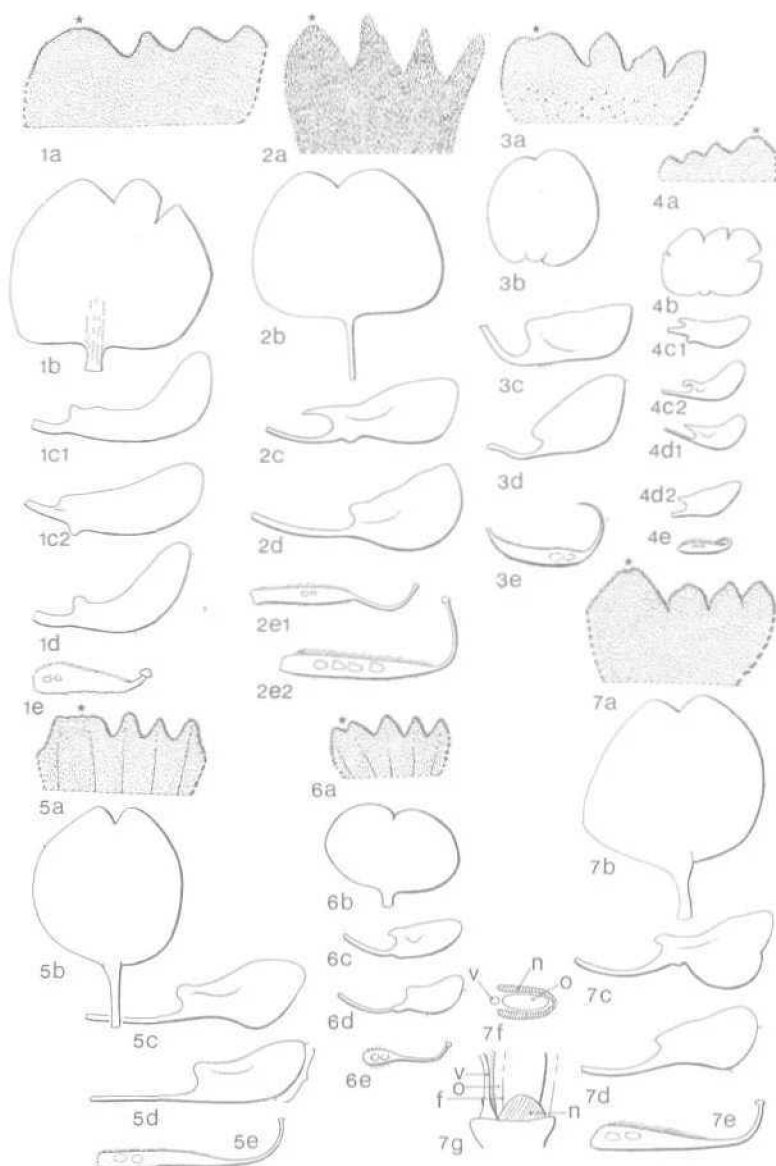


Plate D.

1. *S. persicus* (a, Endert 5410, b, c¹, d, e, Kostermans 7108, e², Motley 734).
 2. *S. pulcher* (a, e¹, Henry 13331, b, c, d, e², Henry 12780), 3. *S. purpureus* (Stocks s.n.).
 4. *S. multiflorus* (a, b, c¹, d², e, Maidin 7331, e², d¹, SAN 50966), 5. *S. ridleyi* (Ridley 6401), 6. *S. auricomus* (S. 22446), 7. *S. suberectus* (a, b, c, d, e, Kerr 5435, f, g, Kerr 1826). a, calyx, b, standard, c, c¹, c², wing petal, d, d¹, d², keel petal, e, e¹, e², pistil, f, diagram showing transverse cut through ovary and nectary: v= vexillary stamen, n= nectary, o= ovary, g= same as f, seen from aside, t= filament sheath (a broken line, the sheath is removed to show the ovary).

THE FRUIT

The pod is samaroid with a thin, sometimes nearly transparent wing and a narrower thickened apical part which bear the seed, also in species where the ovules are subbasally attached in the locule of the ovary. At the dorsal side the seam is thickened. As mentioned before, only the apical ovule develops into a seed. After some elongating the basal part of the young fruit broadens into a membranous wing. In this stage the style drops off; the petals may stay longer.

The seed is laterally flattened and attached just before or even in the apical curvature of the dorsal margin of the pod. In the latter case the apical part of the pod is slightly curved so that the style remnant is deflected ventrally (see plate F, 3c) and 13.

THE SEEDLING

The pod is indehiscent or only slightly dehiscent by the development of the taproot and during germination the fruit wall and testa remain around the cotyledons as far as they are not yet decomposed. According to De Vogel (1979) it belongs to the *helicopsis* type and subtype. He studied *S. macropterus* and observed that the radicle is first pushed out of the fruit by elongation of the petioles of the cotyledons. The hypocotyl is short and remains subterranean, while the (still enclosed) cotyledons remain on the same (ground) level. The first foliar leaves are unifoliate and opposite with interpetiolarly connate stipules.

In one specimen of *S. parviflorus* a germinated seed was found. The taproot had just pushed out between the two sides of the apical part of the pod.

SYSTEMATIC POSITION

Miquel (1855) placed both *Spatholobus* and *Butea* in the subtribe Erythrinae of the tribe Phaseoleae. In Bentham's system (1865) *Spatholobus* was also placed in the tribe Phaseoleae, but in the subtribe Galactiinae, characterized by inflorescences with a 'nodose' insertion of the flowers (i.e. inflorescences with the flowers in fascicles), rarely a wide panicle, small or caducous bracts, an often 4 lobed calyx (two superior lobes united into one), equally long petals, a free vexillary stamen, and a beard less style. In Bentham's system only *Butea* was placed in the Erythrinae; the petals differ in size and the flowers are large and attractive (suggestion of pollination by birds). Taubert (1894) followed the same idea. Hutchinson (1964) modified the system of Bentham by giving tribal state to most subtribe; *Spatholobus* is consequently in his tribe Galactieae and *Butea* in the Erythrinae.

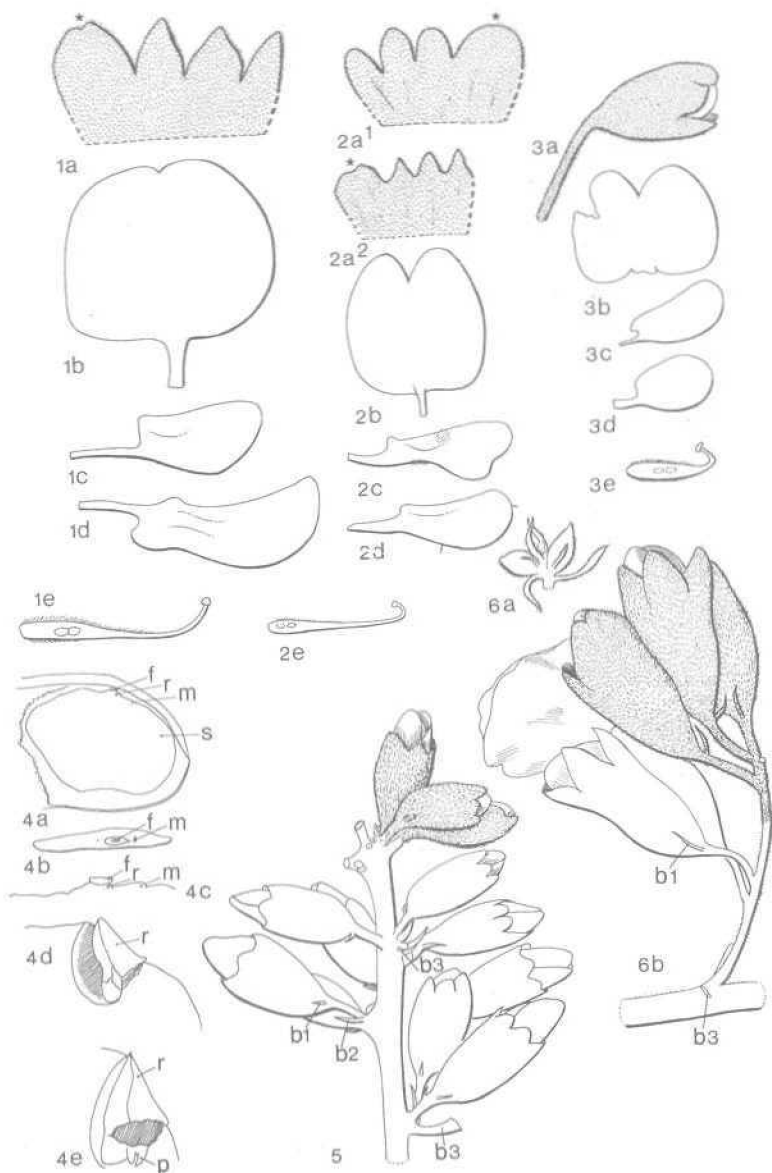


Plate E.

1. *S. varians* (Kerr 8744A), 2. *S. macropterus* a¹, b-d. Elmer 21175, a². A 1137), 3. *S. pallidus* (Kerr 12317) a, a¹, a². calyx or flower from aside, b. standard, c. wing petal, d. keel petal, e. pistil, 4. Seed of *S. parviflorus* (BKF 37778) a. apex of pod, opened to show position of seed (s= seed, f= funicle, r= timaril, m= micropyle), b. seed seen from above, c. dorsal side of seed, d. one cotyledon removed to show plumule, 5. Top of inflorescence of *S. suberectus* (Henry 11977A), 6. Top of inflorescence of *S. varians* (Henry 11771A+B) b¹= bracteole, b²= bract of the flower, b³= bract or scar of bract of the fascicle or flower bearing branch.

Baudet (1978) demonstrated that the Erythrinae are polyphyletic; he considered the differences between Diocleinae and Glycininae artificial and did no further subdivide his (large) subtribe Glycininae, in which *Butea* and *Spatholobus* find their place.

Thuan (1979) places *Spatholobus* as well as *Butea* in the Diocleinae, also a subtribe of the Phaseolae. His argument for not placing them in the Glycininae is that the inflorescence has the flowers in distinct fascicles.

Lackey (1981) considered the Erythrinae "a completely artificial amalgamation", but he maintained the subtribe for convenience. He placed *Spatholobus* traditionally close to *Butea*, admitting that "actual affinities may be elsewhere, but the addition of one more anomalous genus to the Erythrinae will cause little harm".

In our opinion the ideas of Baudet come closest to a proper classification. Apparently the Glycininae (in Baudet's sense) cannot be subdivided into natural groups, and we are not convinced of the value of deliberate artificial subdivision other than for key constructing purposes. The Glycininae consist in our view of a loose assembly of sprout arising from the roots of the evolutionary tree of the Phaseoleae, and combine Phaseoloid foliage with Tephrosoid flowers (the apparently parallelly evolved bird-pollinated genera excepted). *Spatholobus* can be considered the most Tephrosoid genus in this group, as only a few species have obvious Phaseoloid leaves and the flowers are only different from the Tephrosoid genus *Kunstleria* in the number of ovules.

TAXONOMY

RELATION TO BUTEA

Blatter (1929) proposed to combine the genera *Spatholobus* and *Butea* on account of the similar shape of the pod and the structure of the flower. In *Butea* he treats *Spatholobus* as a separate section. Already earlier (1908) Prain noted the similarity of *Spatholobus* and *Butea*, but he considered it more convenient to keep them separate. In his view the only difference is 'the greater number of smaller and differently coloured flowers in *Spatholobus*. In our view there are more arguments to retain the generic state of *Spatholobus*, but this will be argued extensively in a future publication on *Butea* by the first author.

ABSTINATION OF INFRAGENERIC SUBDIVISION

Amazingly enough, former investigators never proposed any subdivision of the genus *Spatholobus*. On account of overall similarity we

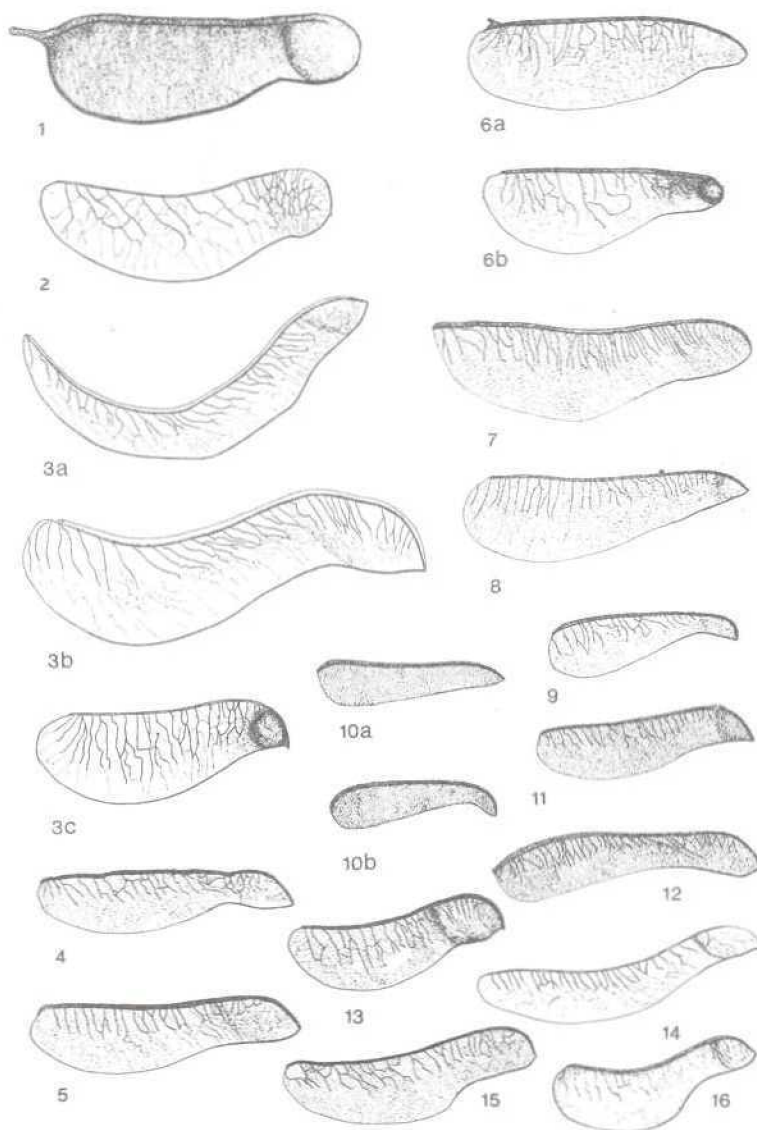


Plate F.

1. *S. arviolorus* (Griffith, Wew Distr. 1683), 2. *S. tittoralis* (Blume s.n. Java), 3. *S. maingayi* (Redley s.n.), 3 b. *S. maingayi* (FB 26841), 3 c. *S. maingayi* (Maingay 611), 4. *S. pulcher* (Rock 2698), 5. *S. harmandi* (Tsang Wai Tak 288), 6 a. *S. macropterus* (Teijsmann 4503), 6 b. *S. macropterus* (Elmer 21562), 7. *S. suberectus* (Rock 1781), 8. *S. ridleyi* (Ridley 6401), 9. *S. gyrocarpus* (Kunstler 10458), 10 a. *S. ferrugineus* (Burck 1904), 10 b. *S. ferrugineus* (Backer 17156), 11. *S. varians* (Henry 11771 D), 12. *S. acuminatus* (s.n. from Wales Island), 13. *S. oblongifolius* (SAN 27454), 14. *S. purpureus* (Talbot 1630), 15. *S. multiflorus* (Puasa 4800), 16. *S. albus* (S. 23683).

could indicate a few groups of more closely related species, but the bulk would be left solitary or 'reticulately' allied, because of lack of sets of correlating characters. One example may illustrate this: *S. acuminatus*, *S. harmandii*, *S. pallidus* and *S. ridleyi* share a similar shape of leaflets and calyx lobes. A similar shape of calyx lobes is also found in *S. merguensis*, *S. oblongifolius*, *S. suberectus*, *S. varians* and *S. pottingeri* which seem otherwise more remotely allied with each other and with the first mentioned group.

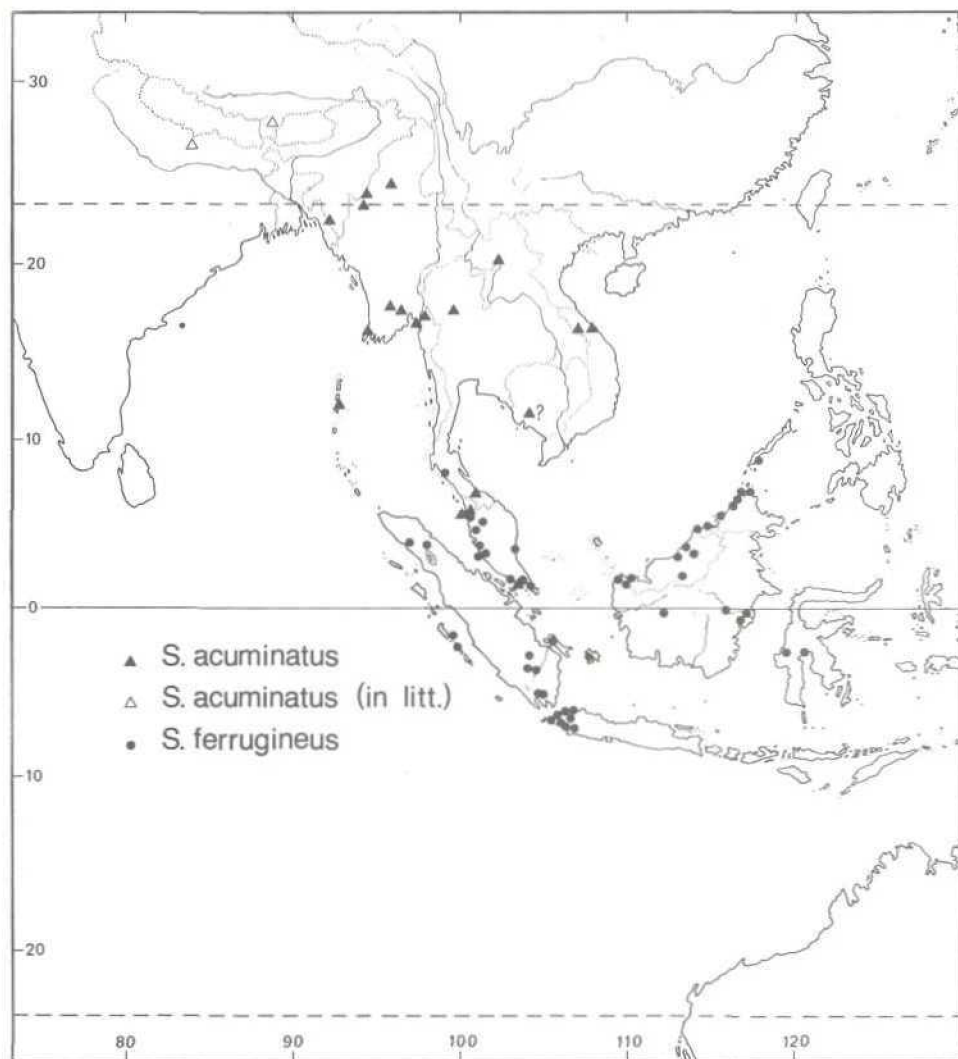
The leaves of the latter species are strikingly similar to those of *S. ferrugineus* and *S. gyrocarpus*, but these species differ in flower characteristics. Any subdivision with gross morphology and geographical distribution as only references seemed unsatisfactory. Possibly correlating characters can be found in pollen morphology, phytochemistry and other disciplines, but the very few scattered data forced us to leave this research to future investigations.

DISTRIBUTION

The genus *Spatholobus* is distributed over continental S. E. Asia from W. India to S. China, the Philippines and W. Malesia. *S. ferrugineus* is the only species also collected on Sulawesi (Celebes). Of the species of continental Asia only *S. acuminatus* and *S. harmandii* occur on either side of the Isthmus of Kra. None of the mainland species occurs on the other side of the Street of Malacca. *S. auritus*, *S. bracteolatus* and *S. dubius* are the only species endemic to the Malay Peninsula (Penang). The species which are wide-spread in the Malay Archipelago occur also in the Malay Peninsula, but they are never found north of the Isthmus of Kra. Of the four wide-spread species in this area *S. ferrugineus*, *S. gyrocarpus*, *S. macropterus* and *S. maingayi*, the first one has the most southern distribution; this species is known from several collections from Sumatra, E. Java and Celebes, but it is only once collected in the Philippines (Aborlan), whereas from the other three species most collections are from the Philippines. *S. macropterus* was also (once) collected in Sumatra. The other species are not (yet) found.

A scattered distribution has *S. littoralis*, which only found in Luzon (Philippines) and E. Java.

Borneo, and especially its northern part, has the highest number of endemic species: *S. albus*, *S. auricomus*, *S. hirsutus*, *S. latistipulus*, *S. oblongifolius*, *S. persicinus*, *S. multiflorus* and *S. viridis* five of which are new.



EXPLANATION OF SOME TERMS

acroscopic/basiscopic side of a leaflet

The side of the leaflets which is turned towards the apex respectively base of the leaf.

calyx lobes/cup ratio

The length of the calyx lobes compare to the length of the calyx cup, not compare to the total length of the calyx.

fascicle

A shortened branch with 2 - 5 flowers. The fascicle can be reduced to a wart or a peduncle with flowers at its apex.

flower length

The length of a flower just before opening from the base of the calyx up to the tip of the folded standard.

nectary

The disc consisting of intrastaminal nectar secreting glands.

It may be separated into lobes, each at the base of a stamen or it may be connate, thus forming a ring round the stipe, but open at the vexillary side.

pseudopanicule

A panicle which fascicles instead of branchlets with solitary flowers.

reduce/smaller anthers

Anthers which are very small compare to the anthers with which they are alternating and never contain pollen, smaller anthers may contain pollen and are only half as long as the larger anthers with which they are alternating.

the ultrajugal part of the rachis

The part of the leaf rachis from the lateral leaflets up to the petiole of terminal leaflet.

SPATHOLOBUS Hassk.

Spatholobus Hassk. in Flora Beihl. 25. 2: (1842) 52; Miq. Ind. Bat 1 (1855) 204; Benth. & Hook., Gen. Pl. 1 (1867) 534; Oliver, Fl. Trop. Afr. 2 (1871) 188; Taub. in Engl. & Prantl., Nat. Pfl. Fam. 3. 3 (1894) 367; Prain in Journ. As. Soc. Beng. 66. 2 (1897) 74; Hook. Fl. Br. Ind. 2 (1879) 193; Ridley, Fl. Mal. Penin 1 (1922) 573; Back. & Bakh. v.d. Brink Jr., Fl. Java. 1 (1963) 630; Hutch. Gen. Fl. Pl. 1 (1964) 428.

Drebbelia Zoll. & Mor., Nat. Geneesk. Arch. Nederl. Indie. 3 (1846) 79.

Woody climber. Leaves alternate, pinnately trifoliate. Stipules present, often caducous, usually narrowly triangular. Rachis pulvinate, the ultrajugal part of the rachis shorter than the infrajugal part. Stipellae present, caducous, subulate. Petiolules pulvinate. Terminal leaflet symmetric, lateral leaflets slightly smaller and either more or less symmetric or asymmetric with a narrower acroscopic side and a broader basiscopic side. Midrib raised at lower surface. Inflorescence an axillary or terminal panicle or pseudopanicle; the lateral branches with two bracts, the flower-bearing branches or fascicles and flowers each with one bract. All bracts early caducous. Pedicel present. Bract-eoles two. Flowers papilionaceous. Calyx campanulate, inside sericeous, outside sparsely pubescent to densely hispid. Calyx lobes 4, the vexillary lobe broad usually with an emarginate apex, at least as long as the other 3 lobes. Standard emarginate, not reflexed during anthesis, glabrous, without basal or laminal callosities. Wing petals sometimes (partly) pubescent, sometimes with a distinct lateral pocket, dorsal auricle and/or ventral auricle. Keel petals usually partly connate along the ventral margin, sometimes free, then valvate or rarely imbricate. Stamens 10, diadelphous, 9 in a sheath and the vexillary one free. Stamens alternately longer and shorter, the latter in some species with reduced anthers. Nectary consisting of 5 or 10 separate lobes, or a dorsally open ring, or indistinct. Ovary pubescent to wooly, gradually narrowed towards the style. Ovules 2 (-4). Style glabrous or up to halfway pubescent, about as long as the ovary. Stigma minute, capitate or flattened and oblique. Pod samaroid, indehiscent, glabrous to pubescent. Seed one, apical, rounded to oblong-reniform, laterally flattened. Testa membranous. Funicle short, dorsal or slightly apical. Hilum sometimes surrounded by a small rim-areole. Lens indistinguishable. Radicle straight or folded.

KEY TO THE SPECIES OF SPATHOLOBUS

1. a. Lateral leaflets symmetric; on lower surface secondary nerves raised or not, venation never raised. — Anthers all fertile 2
- b. Lateral leaflets asymmetric; on lower surface secondary nerves raised, venation raised or not. — Anthers all fertile or alternately fertile and sterile 16
2. a. On lower surface of lateral leaflets secondary nerves not raised. — Inflorescence 2 or 3 times branched 3
- b. On lower surface of leaflets secondary nerves raised. — Inflorescence 3 times branched 9
3. a. Calyx strigose; calyx lobes acute-acuminate with a dark coloured centre. — Leaflets glabrous; apex acuminate to apiculate *S. crassifolius*
- b. Calyx pubescent to puberulous; calyx lobes obtuse to acute without dark centre. — Leaflets glabrous or sparsely pubescent; apex acute to cuspidate 4
4. a. Calyx lobes at most 1/3 of the calyx cup; nectary pubescent 5
- b. Calyx lobes at least 1/2 of the calyx cup; nectary glabrous 6

5. a. Ultrajugal part of the rachis longer than $\frac{1}{3}$ of the rachis. Calyx lobed obtuse, at least $\frac{1}{4}$ of the calyx cup. Leaflets narrowly elliptic; midrib evidently raised *S. ridleyi*
- b. Ultrajugal part of the rachis at most $\frac{1}{3}$ of the rachis. Calyx lobes acute, at most $\frac{1}{4}$ of the calyx cup. Leaflets ovate or narrowly ovate ... *S. albus*
6. a. The ultrajugal part of the rachis less than 0.5 cm long, at most $\frac{1}{8}$ of the total length of the rachis. Leaflets more than 12 cm long. — Rachis about $\frac{1}{4}$ of the length of the terminal leaflet *S. merguensis*
- b. The ultrajugal part of the rachis at least 0.5 cm long, more than $\frac{1}{8}$ of the total length of the rachis. Leaflets less than 11 cm long. — Rachis more than $\frac{1}{2}$ of the length of the leaflets 7
7. a. Petiolules glabrous. Leaflets with pellucid dots. *S. pallidus*
- b. Petiolules pubescent. Leaflets without pellucid dots. 8
8. a. Petiolules sparsely pubescent. Older leaflets glabrous beneath. Inflorescence 3 times branched. — Both surface of leaflets dull brown ... *S. acuminatus*
- b. Petiolules very densely pubescent. Leaflets sparsely pubescent beneath. Inflorescence 2 times branched. — Uppersurface of leaflets blue-green, lower surface dull brown *S. harmandii*
9. a. Calyx puberulous or pubescent, sometimes strigose; calyx lobes at least $\frac{1}{3}$ of the calyx cup or the dorsal lobe longer than other lobes and not emarginate 10
- b. Calyx sparsely pubescent; calyx lobes about equally long, at most $\frac{1}{4}$ of the calyx cup 15
10. a. Calyx pubescent. Nectary and often also the dorsal auricle and ventral part just below the lateral pocket of the wings pubescent ... *S. macropterus*
- b. Calyx puberulous. Nectary and wings glabrous 11
11. a. Flowers not arranged in fascicles 12
- b. Flowers arranged in fascicles 13
12. a. The ultrajugal part of the rachis more than $\frac{1}{8}$ of the total rachis length; leaflets elliptic. — Pairs of lateral nerves at least 10, with regular appearance *S. viridis*
- b. The ultrajugal part of the rachis less than $\frac{1}{8}$ of the total length of the rachis; leaflets narrowly elliptic-obovate. — Pairs of lateral nerves at most 10. *S. oblongifolius*
13. a. Secondary nerves forming distinct marginal arches; lower surface of leaflets distinctly pubescent or sericeous. Flower up to 3 mm long ... *S. multiflorus*
- b. Secondary nerves curved towards the margin, terminating diffusely; lower surface of leaflets minutely pubescent Flower 5-6 mm long 14
14. a. Stipellae longer than petiole. Lower surface of leaflets dull brown. — Vexillary lobe slightly emarginate *S. dubius*
- b. Stipellae shorter than petiolule. Lower surface of leaflets not dull brown. — Vexillary lobe not emarginate *S. littoralis*

15. a. Stipules persistent, asymmetric, 11-12 by 7-12 mm. Pairs of lateral nerves at least 10 *S. latistipulus*
 b. Stipules caducous, symmetric, 3-8 by 1-4 mm. Pairs of nerves at most 8 *S. maingayi*
16. a. Flowers in fascicles 17
 b. Flowers not in fascicles 29
17. a. Stipules not early caducous. Wing petals completely pubescent on the outside. — Venation nearly scalariform at lower surface of leaflets, raised *S. hirsutus*
 b. Stipules caducous in an early stage. Wing petal at most partly pubescent on the outside. — Venation reticulate-scalariform, raised or not raised ... 18
18. a. Secondary nerves terminating in the leaf margin; venation evidently raised at lower surface of leaflets. — Leaflets rust-brown pubescent at lower surface. Inflorescence 3 times branches. Anthers alternately fertile and reduced. *S. ferrugineus*
 b. Secondary nerves not terminating in the leaf margin; venation not raised at lower surface of leaflets or very slightly raised. — Leaflets glabrous or sericeous or pubescent at lower surface. — Anthers alternately fertile and reduced or all fertile and equal length 19
19. a. Calyx lobes at least 1/2 of the calyx cup 20
 b. Calyx lobes up to 1/3 of the calyx cup 23
20. a. Lateral leaflets strongly asymmetric (basiscopic side twice as broad as acroscopic side). Flowers grey-green pubescent, more than 8 mm long. Calyx lobes at least 3/4 of the calyx cup; dorsal calyx lobe with 2 lateral grooves *S. parviflorus*
 b. Lateral leaflets not strongly asymmetric. Flowers brown pubescent, up to about 6 mm long. Calyx lobes about 1/2 of the calyx cup; dorsal lobes without lateral grooves 21
21. a. Stipellae shorter than petiolule. Leaflets glabrous at lower surface. Flowers 5-6 mm long *S. purpureus*
 b. Stipellae longer than petiolule. Leaflets pubescent or sericeous at lower surface. Flowers up to 4 mm long 22
22. a. Secondary nerves curved towards the margin, ending diffusely, up to 7 pairs, at an angle of less than 45° with the midrib. Anthers alternately fertile and reduced *S. auricomus*
 b. Secondary nerves forming marginal arches, 9-14 pairs, at an angle of over 45° with the midrib. Anthers all fertile and of equal length ... *S. multiflorus*
23. a. Stipellae longer than petiolule 24
 b. Stipellae shorter than petiolule, or stipellae caducous in an early stage ... 25
24. a. Flowers up to 4.0 mm long. Calyx sericeous. Anthers alternately fertile and reduced *S. auricomus*
 b. Flowers more than 5 mm long. Calyx puberulous. Anthers uniform *S. dubius*

25. a. Stipellae at least $1/2$ of the petiolule length. Lateral leaflets strongly asymmetric. Anthers 0.25-0.3 mm long; filaments connate up to at least $3/4$ of the filament length. Nectary connate *S. suberectus*
 b. Stipellae at most $1/2$ of the length of the petiolule. Lateral leaflets not strongly asymmetric. Anthers at least 0.5 mm long; filaments connate up to $2/3$ of the filament length. Nectary 10 separate lobes 26
26. a. Lower surface of leaflets densely puberulous. Secondary nerves forming marginal arches, more than 10 pairs 27
 b. Lower surface of leaflets glabrous or pubescence only visible with a lens. Secondary nerves curved towards the margin, terminating diffusely, less than 10 pairs 28
27. a. Stipules up to 10 mm long. Calyx cup as broad as long; calyx lobes acute *S. persicius*
 b. Stipules at least 15 mm long. Calyx cup longer than broad, calyx lobes rounded *S. auritus*
28. a. Calyx densely puberulous; vexillary calyx lobe usually longer than other lobes. — Leaflets often narrowly elliptic minutely puberulous at lower surface, giving a dull appearance *S. littoralis*
 b. Calyx sparsely pubescent; vexillary calyx lobe as long as the other lobes. — Leaflets elliptic, sparsely pubescent at lower surface, nearly glabrous *S. maingayi*
29. a. Anthers alternately fertile and reduced or all fertile but alternately larger and smaller. Nectary consisting of 10 separate lobes, alternately larger and smaller or nectary indistinct 30
 b. Anthers all fertile and of the same size; nectary consisting of 10 separate lobes, equal in size or nectary connate 33
30. a. Flowers up to 6 mm long. Anthers alternately fertile and reduced 31
 b. Flowers more than 7 mm long. Anthers alternately larger and smaller, but all fertile 32
31. a. Inflorescence 2 times branched. Calyx strigose; calyx lobes narrow, acuminate. Calyx cup about 2.5 mm long *S. bracteolatus*
 b. Inflorescence 3 times branched. Calyx pubescent; calyx lobes deltoid, acute or obtuse. Calyx cup about 1.5 mm long *S. gyrocarpus*
32. a. Leaflets glabrescent, young leaves pubescent. Inflorescence pubescent. Wings pubescent at ventral base. Anthers 0.3 — 0.5 mm long *S. varians*
 b. Leaflets distinctly pubescent at lower surface. Inflorescence hispid at base. Wings glabrous. Anthers up to 0.3 mm long *S. pottingeri*
33. a. Ultrajugal part of the rachis more than $1/4$ of the total length of the rachis. Calyx sparsely pubescent; calyx lobes up to $1/4$ of the calyx cup. Anthers at least 0.5 mm long *S. maingayi*
 b. Ultrajugal part of the rachis less than $1/4$ of the total length of the rachis. Calyx densely pubescent or hispid; calyx lobes at least $1/2$ of the calyx cup. Anthers up to 0.3 mm long 34

34. a. Ultrajugal part of the rachis less than $1/6$ of the total length of the rachis, often too short to measure. Stipellae longer than petiolule. Secondary nerves more than 8 pairs. Calyx strigose or pubescent. Nectary consisting of 10 separate lobes. Apex of leaflets acute or acuminate *S. oblongifolius*
- b. Ultrajugal part of the rachis more than $1/6$ of the total length of the rachis. Stipellae shorter than petiolule. Secondary nerves less than 7 pairs. Calyx densely hispid. Nectary connate. Apex of leaflets truncate, the very apex mucronate *S. pulcher*

SPATHOLOBUS ACUMINATUS Benth.

Spatholobus acuminatus (Wall.) Benth. in Miq. Pl. Jungh. (1852) 238; Miq. Fl. Ind. Bat. 1 (1855) 204; Baker in Hook.f., Fl. Br. Ind. 2 (1876) 494; Ridl., Fl. Mal. Pen. 1 (1922) 575. — *Butea acuminata* (Benth.) Kurz. in J. As. Soc. Beng. 45. 2 (1876) 243; Blatter in J. Ind. Soc. 8 (1929) 135. — TYPE: Wallich 5443 (K, SING).

Spatholobus listeri Prain in J. As. Soc. Beng. 66. 2 (1897) 415. — *Butea listeri* (Prain) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: Lister 293 (K. lecto-); Lister 98, 323, 345 (K, syn-).

Spatholobus roseus Prain in J. As. Soc. Beng. 66. 2 (1897) 415. — *Butea roseus* (Prain) Blatter in J. Ind. Soc. 8: (1929) 137. — *Pongamia rosea* (Grah. ex Wall. Cat. 5907) nom. nud. — TYPE: Wallich 5907 (K).

Spatholobus squamiger Prain in J. As. Soc. Beng. 66. 2 (1897) 144. — *Butea squamigera* (Prain) Blatter in J. Ind. Soc. 8. (1929) 138. — TYPE: Kurz 2596 (K).

Indument puberulous. Stipulus early caducous, 3—7 by 1—1.5 mm. Rachis of leaf 4—13 cm long, the ultrajugal part 0.5—3 cm long. Pulvinus 3—8 by 1—3 mm. Stipellae caducous, 1.5—4 mm long. Petiolule 3—9 by 1—2 mm, sparsely puberulous. Leaves chartaceous to coriaceous, glabrescent; young leaves sparsely pubescent at lower surface. Terminal leaflet elliptic to elliptic ovate, 7.5—14 by 3.5—7.5 cm, base round to acute, apex acute to caudate, the very apex mucronate. Lateral leaflets symmetric. Midrib sunken at upper surface, raised at lower surface. Secondary nerves 7—15 pairs, terminating diffusely towards the margin. Venation reticulate. Flowers arranged solitary in short branches up to 3 cm long; these arranged in axillary/terminally panicles up to 20 cm long; the lateral branches with two bracts, these 0.5 by 1 mm; the flower bearing branches and the folwers with one branch, these about 1.5 by 0.5 mm. Pedicel 1—5 mm. Bracteoles 2, not opposite, very early caducous, inserted from 3 mm up to just below the calyx, ca. 0.5 mm long. Calyx puberulous; cup 2—3 mm long and 2—3 mm in diameter; vexillary lobe often two topped, 1—2.5 by 1.3—2.5 mm; the other 3 lobes obtuse, 1—2.5 by 1—1.3 mm. Standard: blade orbicular, 3.5—6 by 4—6.5 mm, base emarginate, apex emarginate; claw 0.5—2.8 by 0.2—0.5 mm. Wing: blade 3.5—5 by 1.5—2 mm, with a dorsal auricle and lateral pocket; claw 0.5—4 by 0.2—0.5. Keel: blade 3—4.5 by 1.5—2 mm, sometimes with a dorsal auricle and a lateral pocket; claw 0.5—4 by 0.2—0.5 mm. Vexillary stamen 2.5—7 mm long. Filaments alternately longer and shorter, respec-

tively 3.5—7.5 and 3—7 mm long, up to about 2/3 connate, sometimes both margin of the sheath at base with a row of hairs. Anthers 0.2—0.5 mm long, uniform. Nectary indistinct or 10 lobed, small glabrous. Ovary pubescent, at base with tufted hairs, 2—4 by 0.5—0.75 mm. Ovules usually 2, apical. Style glabrous 1.5—4 mm long. Stigma oblique, capitate. Pod 7.5—10 by 1.5—2 cm, light brown pubescent.

DISTRIBUTION: Burma, Thailand, Laos, Vietnam, Andamans, Malay-Peninsula.

HABITAT: Open jungle, overgreen forest, at the edges along a river and on hills. Rocky soil, loam. Altitude up to 350 m.

FIELD NOTES: Woody liana up to 30 m. Young leaves reddish. Rachis smooth, hard and tough. Axis of inflorescence light green. Flowers fragrant. Calyx red, or red with the upper half whitish. Corolla white to yellowish with a pinkish to red base. Pods green.

NOTES 1: In this notes on *Spatholobus*, Benthams already mentioned the resemblance of *Pongamia rosea* to *S. acuminatus*. Prain, however, kept it separate from *S. acuminatus* when he transferred *P. rosea* to *Spatholobus*. We agree with Benthams opinion that *S. roseus* differs not very much from *S. acuminatus*, although the type material of the latter (Wallich 5443) only shows the species in (unripe) fruit. But the leaves are rather characteristic and although the leaves of Wallich 5907 (*P. rosea*) are larger, they do not seem different in spite of Prains argument that they are thicker and have a shorter apex.

Spatholobus squamiger has the same kind of leaflets as *S. acuminatus*, which it closely approaches in the views of Prain. In his notes he states that *S. squamiger* differ in having more numerous and ascending, not almost transverse, lateral nerves. But the leaflet enclosed which accompanies the photo of the specimen Kurz 2596 in K has fewer lateral and less ascending nerves than those of *S. acuminatus*. Prain also mentioned different colours of the flower: white in *S. squamiger* and red in *S. acuminatus*. This probably due to inaccurate field notes. We have reconstructed from the field notes that the calyx is mainly red and the petals are mainly white. Depending the flowering stage, the inflorescence gives then a red to white impression.

Spatholobus listeri, described in the same article, is in our opinion also conspecific with *S. acuminatus*. According to Prain *S. listeri* resembles *S. acuminatus* very much, but differs in leaves, panicles and bracts. However, the leaves of the cited specimens are equal to those of Wallich 5907, which he cited as *S. roseus*. The only striking characters, in both Wallich 5907 and the type specimens of *S. listeri* is the pubescence on both margins of the base of the filament sheath. This character is

observed also in *Butea*. The mentioned difference in the thickness of the leaves is most probably caused by a difference in age; the young leaves are nearly membranous and reddish brown in colour (in sicc.).

2. *Spatholobus acuminatus* resembles *S. harmandii*, but differs mainly in the leaflets. The fully nature leaflets of *S. acuminatus* are not as coriaceous as those of *S. harmandii* and do not have the striking bluish green upper surface. The petiolules are not very densely pubescent and glabrescent.

3. *Spatholobus acuminatus*, *S. harmandii* and *S. pallidus* are very close considering the uniform small anthers, the obtuse and relatively long calyx lobes, the more or less symmetric leaflets with only the main nerve raised at the lower surface their acuminate apex and the panicles without fascicles. *S. riddleyi* is also close in these characters.

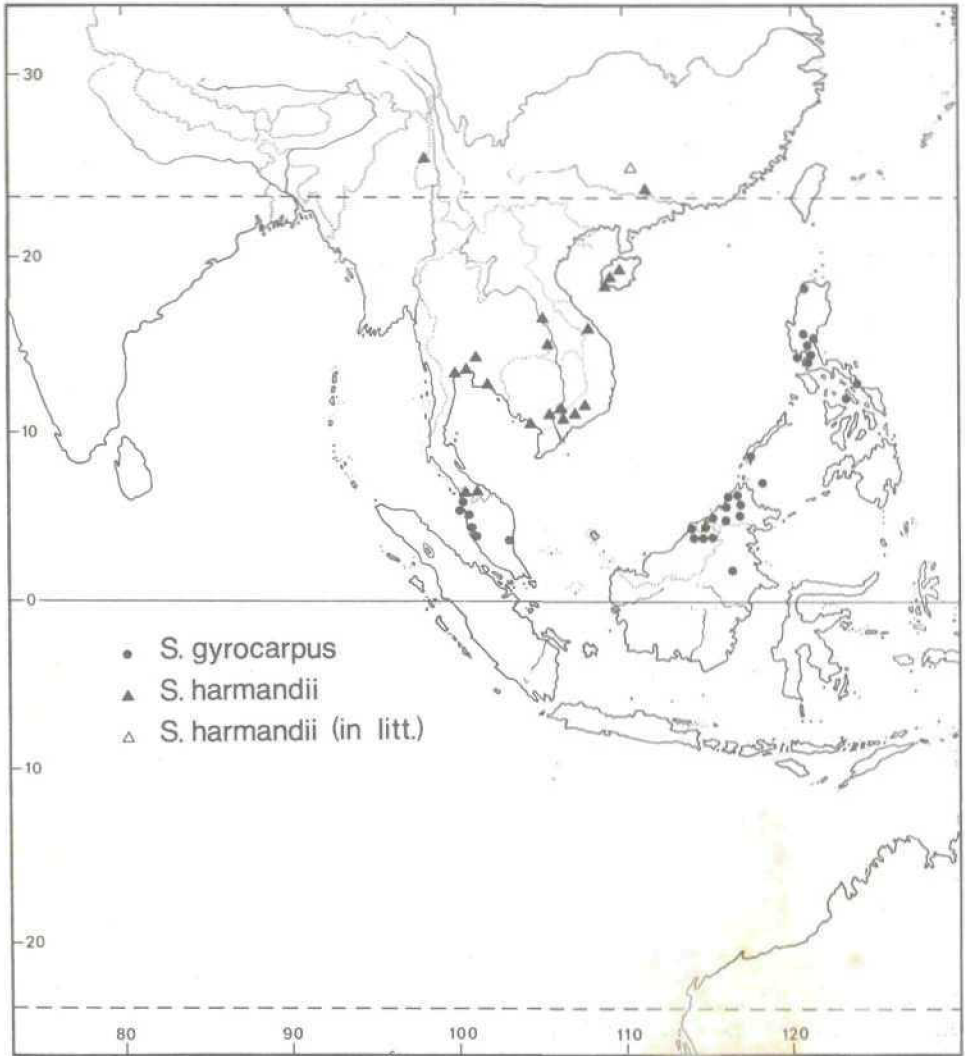
Other species with the same kind of calyx are *S. pottingeri*, *S. merguensis*, *S. oblongifolius*, *S. suberectus*, *S. varians* and in a lesser extent *S. purpureus*.

4. See also the notes on *Spatholobus crassifolius*, *S. harmandii*, *S. maingayi*, *S. merguensis*, *S. pallidus*, *S. pottingeri*, *S. purpureus*, *S. riddleyi*, *S. varians* and *S. riparius*.

Spatholobus albus* Wiriadinata & Ridder-Numan *spec. nov.

Stipulae mox deciduae. Folia subtus sparse minutissime puberula, costa subtus prominante nerve secundarii subtus non prominentibus, 3—7 paribus, ad marginem diffuse terminatis, foliolo anguste ad elliptic ovate, basi rotundato ad acuto, apice acuto ad acuminato, foliolis lateralibus fere summetricis. Inflorescentia paniculata. Bracteoli calyce arcte inserti. Calyx puberulus, tubo circa 2.5 mm longo, 1.5 mm in diametro, lobis 0.5 mm longis, acutis, lobo vexillary paulo emarginato. Antherae uniformes, ad 0.5 mm longae. Nectarium 5—10 lobato, pubescens. — TYPE: S. 32363 (B -holo, K, SAR, SING, in flower). Paratype: (K, SAR, in fruit).

Indument puberulous. Stipules caducous, not seen. Rachis 2.3—3.6 cm long, the ultrajugal part 0.1—0.7 cm long. Pulvinus 3—6 by 0.5—1 mm. Stipellae 1 mm long. Petiolule 2—5 by 1—2 mm, glabrous to minutely puberulous. Leaves coriaceous, upper surface glaucish, glabrous, lower surface sparsely puberulous. Terminal leaflets 4—11.5 by 1—2.5 cm, narrowly ovate to elliptic ovate, base round to acute, apex acute to acuminate, mucronate. Lateral leaflets more or less symmetric. Midrib sunken at upper surface, raised at lower surface. Secondary nerves 3—7 pairs, terminating diffusely toward the margin. Venation reticulate. Flowers arranged in axillary panicles up to 7 cm long; the lateral branches up to about 0.5 cm long with two bracts, these 2 mm long; the



flowers with one bract, this 1 mm long. Pedicel 1 mm long. Bracteoles 2, early caducous, inserted just below the calyx, 1 mm long, subadpressed. Calyx puberulous; cup about 2 mm long and 1.5 mm in diameter; vexillary lobe slightly two topped, 0.5 by 2 mm; the other 3 lobes acute, 0.5 by 1 mm. Standard: blade 3.5 by 4.5 mm, orbicular, base truncate, apex emarginate; claw 1 by 0.3 mm. Wing: blade 3 by 1.5 mm, with a dorsal auricle and a lateral pocket; claw 1 by 0.2 mm. Keel: blade 3 by 1.5 mm, with a lateral pocket; claw 1 by 0.3 mm. Vexillary stamen 3 mm long. Filaments alternately longer and shorter, respectively 3.5 and 3 mm long, connate up to about 2/3. Anthers up to about 0.5 mm long, uniform. Nectar: 5—10 lobed, glabrous, pubescent. Ovary densely puberulous to pubescent, 2.5 by 0.5 mm. Ovules 2, medial or apical. Style glabrous to the top, 2 mm long. Stigma minutely capitate. Pod 4.4—6.5 by 1.5—2 cm, brown puberulous.

DISTRIBUTION: Borneo (Sarawak). Limbang (S. 32363, S. 32206); Balingian (S. 23683).

HABITAT: On ridges and hillslopes, Dipterocarp forest. On sandy loam. Altitude up to 300 m.

FIELD NOTES: Climber up to 20 m. Stem and 15 cm in diameter. Inflorescence light green (in bud). Flowers white, except for the brown anthers. Fruit dirty yellow.

NOTES: 1. As in *S. littoralis* the leaflets are narrowly elliptic. The pubescence of the calyx resembles that of *S. littoralis*, but the lobes are shaped differently. *S. albus* has a pubescent nectary like *S. ridleyi* and *S. macropterus*.

2. See also notes on *S. viridis*.

Spatholobus auricomus Ridder-Numan *spec. nov.*

Stipulae mox deciduae. Folia subtus sericea, costa nervis secundariisque prominentibus, 5—7 paribus ad marginem curvatis diffuse terminatis; foliolo terminali elliptico, basi acuto, apice acuminato, foliolis lateralibus asymmetricis, latere basis-copio-ovato, acrocopic elliptico. Inflorescentia pseudo-paniculata. Bracteoli circa 0.5 mm sub calyce inserti. Calyx sericeus, tubo circa 1.5 mm longo, 1—1.5 mm in diametro, lobis 0.5—0.75 mm longis, acutis, lobo vexillar emarginato. Nectarium 10 lobatum, glabrum.

TYPE: S. 22446 (K- holo, SING)

Indument golden brown sericeous. Stipules early caducous, scar 4 mm wide. Rachis 5—7.5 cm long, the ultrajugal part ca. 1.5 cm long. Pulvinus 0.5—1 by 1—2 mm. Stipellae 5—7 by 0.25 mm. Petiolule 4—5 by 1 mm, sericeous. Leaves chartaceous, upper surface glabrescent, lower surface sericeous. Terminal leaflet 6.5 by 3 cm, elliptic, base acute, apex acuminate. Midrib and secondary nerves raised at lower surface. Midrib and secondary, nerves 5—7 pairs, curved towards the margin, ending

diffusely. Venation reticulate. Flowers arranged in fascicles, these arranged in axillary or terminally panicles up to 14 cm long; the lateral branches with two bracts, these 6 by 2 mm the fascicles with one bract, this 4 by 1 mm the flowers with one, very caducous bract, not seen. Pedicel up to 2 mm long. Bracteoles 2, inserted 0.5 mm below the calyx, 0.3 mm long, spreading. Calyx sericeous. Calyx cup c. 1.5 mm long and 1—1.5 mm in diam vexillary lobe two topped or slightly emarginate, 0.5—0.75 by 1.5—2 mm, the other 3 teeth acute, 0.5—0.75 by 0.5—0.75 mm. Standard: blade 2—2.5 by 3.5—4 mm, broadly elliptic, base obtuse to slightly decurrent, apex emarginate; claw 0.5 by 0.2—0.5 mm. Wings: blade 2 by 1 mm, sometimes with a small dorsal auricle claw 1.5 by 0.2 mm. Keel: blade 1.5—2 by 1.2 mm claw 1.5—2 by 0.2 mm. Vexillary stamen 2 mm long. Stamens alternately longer and shorter, respectively 2.5—3 and 1—2 mm long, up to 1/6 connate. Anthers 0.3 mm long, the shorter filaments with reduced anthers. Nectary 10 lobed, glabrous. Ovary 1 by 0.5 mm, sparsely pubescent. Ovules 2, filling the locule completely. Style ca. 2 mm long, glabrous. Stigma capitate. Pod not seen.

DISTRIBUTION: NW-Borneo. Sarawak: Bt. Mersing (S. 22446, S. 22517); Marudi (S. 23063).

HABITAT: Mixed Dipterocarp forest and secondary forest. At slopes of basalt hills. Altitude ca. 44 m.

FIELD NOTES: Woody climber up c. 15 m. Flowers white, or calyx white and petals pink. Buds light greenish brown, covered with silvery hairs.

NOTES: 1. This species resembles *S. multiflorus*, but differs mainly in the leaflets. The angle between the midrib and the secondary nerves is less than 45° in contrast with the wider angle of *S. multiflorus*.

2. See also notes on *S. multiflorus*.

***Spatholobus auritus* Ridder-Numan, spec. nov.**

Stipulae persistentiae 17—18 mm longae, 4—6 mm latae. Folia subtus puberula, costa nervis secundariisque prominentibus, circa 14 paribus, arcibus marginalibus distincte compositis; foliolo terminali elliptice ovato, basi rotundato, apice acuminato, foliolis lateralibus asymmetricis, lateri basiscopico ovato, acroscopico elliptico. Inflorescentia pseudopaniculata. Bracteoli calyce arte inserti. Calyx puberulus, tubo circa 2.5 mm longo, circa 2 mm in diametro, lobis 0.3 longis, rotundatis, lobo vexillari emarginate. Antherae uniformes, 0.5 mm longae. Nectarium 10 lobato, glabrum.

TYPE: *Haniff 3703* (K-holo, SING).

Indument brown puberulous. Stipules persistent, 17—18 by 4—6 mm. Rachis 8—12 cm long, the ultrajugal part 1.5—2 cm long. Stipellae caducous, not seen. Pulvinus 8 by 3 mm. Petiolule 7 by 2 mm, puberulous. Leaves coreaceous, upper surface glabrescent, lower surface puberulous.

Terminal leaflet 14 by 7.5 cm, elliptic-ovate, base round, apex acuminate, mucronate. Lateral leaflets asymmetric; acroscopic side elliptic, base round, apex acuminate. Midrib sunken at upper surface, midrib and secondary nerves raised at lower surface. Secondary nerves c. 14 pairs, forming distinct marginal arches. Venation reticulate-scalariform. Flowers arranged in fascicles, these arranged in panicles up to 21 cm long; the lateral branches up to 6 cm long with 2 bracts, these 5 by 2 mm; the fascicles with 1 bract, this 4 by 1 mm; the flowers with 1 bract, this 2 mm long. Pedicel 1 mm long. Bracteoles 2, inserted immediately below calyx, up to 1 mm long, spreading. Calyx puberulous; cup 2.5 mm long and 2 mm in diameter; vexillary lobe emarginate 0.5 by 2 mm, the other 3 teeth rounded, 0.3 by 1 mm. Standard: blade 5 by 4 mm, orbicular, base truncate, apex emarginate; claw 2 by 0.5 mm. Wing: blade 3 by 2.5 mm, with a small lateral pocket and a dorsal auricle; claw 2.5 by 0.2 mm. Keel: blade 3 by 2.5 mm, with a small dorsal auricle; claw 3 by 0.2 mm. Vexillary stamen 3.5 mm. Filaments alternately longer and shorter respectively 4 and 3.5 mm long, connate up to 2/3. Anthers 0.5 mm, uniform. Nectary 10 lobed, glabrous. Ovary puberulous, 2.5 by 0.5 mm. Ovules 2, basi-medial. Style glabrous, 2.5 mm long. Stigma minute, capitate. Pod not seen.

DISTRIBUTION: Malay Peninsula (Penang)

HABITAT: Near a waterfall.

NOTES: 1. The leaflets are densely brown puberulous at the lower surface. The secondary nerves are very regular and form distinct arches. The stipules are relatively long, about 17 by 5 mm.

2. See also notes on *S. persicius*.

SPATHOLOBUS BRACTEOLATUS Prain ex King.

S. bracteolatus Prain ex King in J. As. Soc. Beng. 66, 2 (1897) 75; Ridl., Fl. Mal. Pen. 1 (1922) 574. — *Butea bracteolatus* (Prain ex King) Blatter in J. Ind. Soc. 8 (1929) 135. — TYPE: *Kunstler 8079* (K, SING).

Indumentum brown hispid. Stipules caducous, 7—8 by 2—3 mm. Rachis 5—9 cm long, the ultrajugal part ca. 1 cm long. Pulvinus 7—10 by 2—3 mm, densely strigose. Stipellae early caducous, not seen. Petiolule 4—6 by 1—2 mm, densely pubescent. Leaves coriaceous, glabrescent; young leaves pubescent. Terminal leaflet 7.5—14 by 2.5—9.5 cm, elliptic to elliptic-ovate, base acute, apex acute to acuminate. Lateral leaflets asymmetric; acroscopic side ovate, base acute, apex acuminate; basicopic side elliptic, base acute, apex acuminate. Midrib and secondary nerves raised at lower surface. Secondary nerves 6—7 pairs, diffusely ending towards the margin. Venation reticulate-scalariform. Flowers only seen in bud. Flowers arranged solitary in short branches up to 7 cm long; these arranged in axillary or terminal panicles up to 23 cm long; the lateral branches with one bract, this 7—8 by 1.5 mm; the flowers with one bract, this 4—5 by 0.2 mm. Pedicel c. 0.5 mm. Bracteoles 2, inserted just below

the calyx, 1.5 mm long, subadpressed. Calyx strigose. Calyx cup 2.5 mm long and 1.5 mm in diameter; calyx lobes acuminate to cuspidate, vexillary lobe two topped, 1.5 by 1 mm, the other 3 lobes 1.5—2 by 0.5—0.8 mm. Standard: blade elliptic, 2 by 1.5 mm, base obtuse, apex emarginate; claw 0.1 by 0.2 mm. Wing: blade 1.2 by 0.7 mm; claw 0.2 by 0.2 mm. Keel: blade 1 by 0.5 mm; claw 0.1 by 0.2 mm. Vexillary stamen 0.5 mm. Stamens alternately longer and shorter, respectively 1 and 0.5 mm long, up to about 1/4 connate. Anthers 0.2 mm, alternately fertile and reduced. Nectary indistinct; ovary 1 by 0.2 mm, strigose. Ovules 2, apical. Style 0.5 mm, strigose up to halfway. Stigma elongated. Pod not seen.

DISTRIBUTION: Malay Peninsula (Penang)

HABITAT: Dense jungle, near the foot of high rocks. Altitude 1000—1300 m.

FIELD NOTES: A slender creeper, 5—7 m long. Leaves glossy bright green; younger leaves tinged with red. Bud light brown.

NOTES: 1. Resembles *S. oblongifolius* in the leaves. The flowers are different from any other species of *Spatholobus*; the calyx lobes are very narrow, with a dark spot (on the vexillary one two), the bract and bracteoles are also long and narrow. According to Prain this species 'in externals more resembles *S. roxburghii* (= *S. parviflorus*) than it does any other Malayan species'. In our opinion it differs in most characters except for the relative length of the calyx lobes.

2. See also notes on *S. merguensis*.

SPATHOLOBUS CRASSIFOLIUS Benth. in Miq.

S. crassifolius (Wall.) Benth. in Miq., Pl. Jungh. (1852) 238; Baker in Hook. f., Fl. Br. Ind. 2 (1876) 194. — *Butea crassifolia* (Benth.) Blatter in J. Ind. Soc. 8 (1929) 136. — *Pongamia crassifolia* (Wall. Cat. 5013) *nom. nud.* — TYPE: Wallich 5912 (K).

Indument brown strigose to hispid. Stipules caducous, 7 by 2 mm. Rachis 4.4—11 cm long; ultrajugal part 1.2—2.5 cm long. Pulvinus 4 by 1.5 mm, densely puberulous. Stipullae caducous, 4—5 mm long. Petiole 5 by 1 mm, densely puberulous. Leaves coriaceous, glabrous. Terminal leaflet 7—13.5 by 2.5—4.5 cm, elliptic-ovate to ovate, base subcordate to roundedly acute, apex acuminate to apiculate. Lateral leaflets slightly smaller, symmetric. Midrib raised at lower surface. Secondary nerves c. 7 pairs, not very distinct between venation, diffusely ending towards the margin. Venation reticulate. Flowers arranged solitary in short branches, these arranged in axillary or terminal panicles up to 22 cm long; the lateral branches with two bracts, these 3 by 2 mm; the flower bearing branches with 1 bract, this 2 mm long. Pedicel 2—3 mm long. Bracteoles 2, 1 mm long, inserted 0.5—1 mm below the calyx, opposite. Calyx strigose, cup 2—2.5 mm long and 1.5—2 mm in dia-

meter; vexillary lobe 1— or 2— topped, 1—1.5 by 1.5—2 mm, the other 3 lobes acute to acuminate, 1.25—2 by 1 mm. Standard blade 3—3.5 by 4—4.5 mm, elliptic, base cordate to decurrent, apex emarginate; claw 0.5—1.5 by 0.5 mm. Wing: 2.5—3.5 by 1—2 mm, with a lateral pocket and a dorsal auricle, which is sometimes pubescent; claw 1—2 by 0.2 mm. Keel: blade 2.5—3 by 0.5—2 mm; claw 1—2 by 0.2 mm. Vexillary stamen 2—4.5 mm long; Filament alternately longer and shorter, respectively 2.5 and 5.5 mm long, up to about halfway connate. Anthers c. 0.3 mm long, uniform. Nectary indistinct. Ovary pubescent, 1.5—3 by 0.5 mm. Ovules 2, apical. Style glabrous, 1—2 mm. Stigma minute, oblique. Pod not seen.

DISTRIBUTION: India (Sillet, Khasia).

NOTES: *S. acuminatus* and *S. harmandii*, as for the leaflets, resemble *S. crassifolius*, which differs in having thicker leaflets and a cuspidate apex, a very dense inflorescence, a strigose calyx, and acute or acuminate calyx lobes. The flowers are very dark in dried state; they are probably scarlet in vivo.

SPATHOLOBUS DUBIUS Prain

S. dubius Prain in King in J. As. Soc. Beng. 66, 2 (1897) 79; Ridl., Fl. Mal. Pen. 1 (1922) 575. — *Butea dubia* (Prain) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *Kunstler 7585* (K. SING, lecto-), *Curtis* (K. SING).

Indument puberulous brown. Stipules caducous, 5—9 by 1.5—2 mm. Rachis 2—5.5 cm long, the ultrajugal part 1.2—1.7 cm long. Stipellae not very early caducous, 4—8 by 0.5 mm, longer than petiolule. Pulvinus 3—5 by 1—2 mm, puberulous. Petiolule 2—4 by 1—1.5 mm, puberulous. Leaves coriaceous upper surface glaucish green, pubescent glabrescent, lower surface dull light brown, short puberulous. Terminal leaflet narrowly elliptic-ovate, 6—14.5 by 1.5—5.5 cm, base acute-obtuse, apex acute. Lateral leaflets more less symmetric. Midrib and secondary nerves 5—8 pairs, curved towards the margin, terminating diffusely. Venation reticulate. Flowers in fascicles, these arranged in panicles up to 13 cm long; the lateral branches with one bract, this 3 by 1 mm; the fascicles with one bract, this 2 by 0.2 mm; the flowers with one bract, this 1 mm long. Pedicel 1.5—2.5 mm long. Bracteoles 2, very early caducous, 0.2—0.5 mm long, inserted 0.2 mm below the calyx. Calyx puberulous; cup 2—2.5 mm long and 1.5—2.5 mm in diameter; vexillary lobe slightly emarginate, 0.7—1.2 by 1.5—2 mm; the other 3 lobes acute, 0.7—1 mm. Standard: blade 3.5—4.5 by 3.5—4 mm, nearly orbicular, base truncate, apex emarginate; claw 1.5—2 by 0.2 mm. Wing: blade 3 by 1.3—2 mm, with a lateral pocket and sometimes a small ventral and/or dorsal auricle; claw 2—2.5 by 0.2 mm. Keel: blade 2.5 by 1.3—1.7 mm, with a small lateral pocket and sometimes a small dorsal auricle; claw 2—3 by 0.2 mm. Vexillary stamen 2.5—4.5 mm long. Filaments alternately longer and shorter, 3—6 respectively 2.5—5 mm long, up to about 2/3 connate. Anthers

0.3—0.5 mm long, uniform. Nectary consisting of 10 small lobes. Ovary pubescent 2—3 by 0.5 mm. Ovules 2, medial. Style glabrous 2—2.5 mm long. Stigma flattened capitate. Pod sparsely pubescent, glabrescent, 9.5—10.5 by 2.5 cm.

DISTRIBUTION: Malay (Penang, Perak).

HABITAT: 'Cling to large trees'. Dense forests. Alt. up to 800 m.

FIELD NOTES: Woody climber, up to 50 m high. 'Skin' (= bark?) 4—8 cm. Leaves glossy bright green, when old dark green.

NOTES: 1. According to Prain (in a note accompanying the type) this species is nearly related to *S. mainyayi*, but the flowers are different in pubescence, calyx lobes, and anther size. In a letter to Curtis he said to be 'pretty sure' that this species was a *Spatholobus*, but that he would describe it provisionally as *S. dubius* until the pods were known. Prain stated that it is 'apparently' nearest to *S. littoralis*, with which we agree, because there are very few differences between these species. The stipellae of *S. dubius* are longer than the petiolule, in *S. littoralis* they are shorter. The leaflets are as narrow as those of *S. littoralis*, but thicker and dull brown puberulous at the lower surface. The calyx lobes are of the same length in *S. dubius*, and in *S. littoralis* the vexillary lobe is longer and not emarginate. The pod (as stated above not known by Prain) is smaller to that of *S. littoralis*, glabrescent and slightly bent.

2. See also notes on *S. macropterus*.

SPATHOLOBUS FERRUGINEUS (Zoll. & Mor.) Benth. in Miq.

S. ferrugineus (Zoll. & Mor.) Benth. in Miq., Pl. Jungh. (1852) 238; Back. & Bakh. f., Fl. Java 1 (1963) 630; Burk., Diet. 2 (1935) 2098; Burk. & Hend. in Gard. Bull. S. S. 3 (1925) 366; Craib, Fl. Siam. Enum. 1 (1928) 446; Heyne, Nutt. Pl. 2 (1916) 329; King in J. As. Soc. Beng. 66, 2 (1897) 75; Miq., Fl. Ind. Bat. 1 (1855) 203; Miq., Sum. (1960) 112, 303; Merr. in Philip. J. Sc. 11 (1916) 91; Merr. in J. Str. Br. As. Soc. spec. number (1921) 310; Merr. Pl. Elm. Born. (1929) 109; Ridl., Fl. Mal. Pen. 1 (1922) 574; Ridl. in Kew Bull. 1926, 64. — *Drebbelia ferruginea* Zoll. & Mor. in Zoll. in Nat. Geneesk. Arch. N. I. 3 (1846) 66, 79. — *Butea ferruginea* (Zoll. & Mor.) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *v. Hasselt s.n.* ('legit in sylvit prope Panimbang Javae prov. Bantam') (n.v., not in L.).

Indument rusty brown velutinous. Stipules caducous, 3—6 by (2—) 4—6 mm, recurved. Rachis 5—24 cm long; the ultrajugal part 0.5—4.5 mm long. Pulvinus 4—12 by 2—6 mm, pubescent to velutinous. Stipellae caducous, 2—5 mm long. Petiole 2—9 by 2—4 mm. Leaves coriaceous, velutinous or sericeous, glabrescent between the nerves. Terminal leaflet (7—) 12—20 (—49) by (5—) 7—16 (—30) cm, elliptic, elliptic-ovate, elliptic-obovate or nearly circular, base obtuse to acute, apex round, acute to caudate, mucronate, sometimes very apex emarginate. Lateral leaflets

asymmetric; acroscopic side elliptic to elliptic-obovate, base obtuse to acute; basiscopic side ovate to elliptic-ovate, base obtuse, apex obtuse to acute. Nerves raised at lower surface of leaflets. Secondary nerves 5—8 pairs curved towards and terminating into the marginal nerve. Venation reticulate-scalariform. Flowers in fascicles, these arranged in axillary or terminally panicles up to 45 cm long; the lateral branches with two bracts, these 5 by 4 mm, recurved; fascicle bearing branches with two bracts, these 3—5 by 2 mm; the fascicle with one bract, this 2—2.5 by 1 mm; the flowers with one bract, this 2 by 0.5 mm. Pedicel 1—4 mm long. Bracteoles 2, inserted 0.5—2 mm under the calyx, 0.5—1.5 mm long, sometimes opposite, spreading. Calyx pubescent; cup 2—3 mm long and 2 mm in diameter, vexillary lobe usually two toed, 0.75—1.5 by 1.5—2 mm; the other 3 lobes acute 0.75—1 by 1 mm. Standard: blade elliptic to obovate, 3—4.5 by 3—5 mm, base decurrent, top emarginate; claw 1.5—2 by 1 mm. Wing: blade 2.5—4 by 1—2 mm; with a lateral pocket and a dorsal auricle, sometimes pubescent at lower margin. Keel: blade 2—3 by 1—2 mm, with a dorsal auricle and a lateral pocket; claw 1.5—3 by 0.2—0.3 mm. Vexillary stamen 3—3.5 mm long. Stamens alternately longer and shorter, respectively 4.5—5.5 and 3—4 mm long, connate up to about halfway. Anthers ca. 0.2 mm long, the shorter stamens with a reduced anther. Nectary 10-lobed, glabrous. Ovary 2—3.5 by 0.5—1 mm, wooly at the dorsal side with longer hairs. Ovules 2, medial, funicles sometimes joining at the base. Style 1.5—2.5 mm long, glabrous. Stigma flattened oblique. Pod 4—6 by 1.3—2 cm light brown puberulous. Seed 10 by 5—10 mm.

DISTRIBUTION: Malay Peninsula, Sumatra, Borneo, Java.

HABITAT: Mixed Dipterocarp forest, low montane primary forest, secondary forest, brushwood, belukar, Kerangas sand, coral. On ridges, hill slopes, along roads, at forest edges. Soil ultrabasic, or peaty or with siliceous scales. Altitude up to 1000 m.

FIELD NOTES: Woody climber up to 50 m high. Stem 3—15 cm in diameter, brown hairy. Exudate red or reddish brown. Leaves chartaceous. Petiole and venation brown pubescent beneath. Calyx white to yellowish, petals pinkish, red or purple. Pods yellow green, very glossy transparent.

NOTES: 1. This species distinguishable by its rusty brown pubescence and asymmetric lateral leaflets with a rounded apex and especially by the secondary nerves which are terminating in the margin of the leaflets.

2. See also notes on *S. gyrocarpus* and *S. pottingeri*.

3. A phytochemical survey of the leaves showed the presence of the following compounds: saponins, flavonoides, and triterpenoids. Further chromatographic investigation showed that the saponin consists of at least 6 steroid compounds (see Wiriadinata 1977).

Spatholobus ferrugineus (Zoll. & Mor.) Benth. var. *acutis* Ridder-Numan
var. nov.

Folida paulo parva, acuta, indumento hirsuto luteo-brunneo. — TYPE: *Purseglove 5529* (L. SAR, SING, holo-), *Ridley s.n.* (1915 Matang Road) (K, syn-).

Leaflets rather small, acute, yellowish brown hirsute.

DISTRIBUTION: W. Borneo and Sarawak.

SPATOLOBUS FERRUGINEUS (Zoll. & Mor.) Benth. var. **SERICOPHYLLUS** Ridl.

Ridl., Fl. Mal. Pen. 1 (1922) 574. — TYPE: *Ridley 5578* (SING, lecto-), *Ridley 6394* (K, SING, syn-), *Ridley s.n.* (3 specimens, SING, syn-).

Leaflets rather narrow, yellowish brown sericeous.

DISTRIBUTION: Malay Peninsula.

SPATHOLOBUS GYROCARPUS Benth. in Miq.

S. gyrocarpus Benth. in Miq. Pl. Jungh. (1852) 238; Ridl., Fl. Mal. Pen. 1 (1922) 574; Merr., Enum. Philip. 2 (1923) 310; Miq., Fl. Ind. Bat. 1 (1855) 204; Burk., Dict. 2 (1935) 2098; Baker in Hook. f., Fl. Br. Ind. 2 (1876) 193; Merr. in Philip. J. Sc. 5 (1910) 119; Merr. in Philip. J. Sc. 11 (1916) 90; Merr. in J. Str. Br. As. Soc. spec. number (1921) 310; Merr. in Philip. J. Sc. 29 (1926) 375. — *Butea gyrocarpa* (Benth.) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *Wallich 5442* (K, E, BR, SING).

S. sanguineus Elm. in Leaflet. Philip. Bot. 8 (1919) 3087; Merr., Enum. Philip. 2 (1923) 310. — *Butea sanguinea* (Elm.) Blatter in J. Ind. Soc. 8 (1929) 137. — TYPE: *Elmer 17560* (lecto-, K, L, U, C); *Elmer 18250* (syn-, K, L, C).

Indument yellowish brown sericeous. Stipules reflexed, caducous, 5—12 by 3—6 mm. Rachis of leaf 3.5—20.5 cm long, ultrajugal part 1—9.5 cm. Pulvinus 6—10 by 2—4 mm. Stipulae caducous, 3—7 by 1 mm. Petiolule 5—8 by 2 mm, puberulous. Leaves chartaceous, glabrescent. Terminal leaflets 12—18 by 6—9 cm, ovate to obovate, base rounded acute, apex acuminate to caudate, mucronate. Lateral leaflets slightly smaller, asymmetric; ascroscopic side elliptic-obovate to elliptic-obovate, base acute, apex acuminate to caudate; basiscopic side ovate, base obtuse to acute, apex acuminate to caudate. Nerves raised at the lower surface of the leaflets. Secondary nerves 8—11 pairs, looped towards the margin, sometimes also ending in the margin. Venation reticulate-scalariform. Flowers arranged solitary in short branches, 0.5—3.5 cm long, these arranged in panicles up to 34 cm long; the lateral branches with one or two bracts, these 8 by 4 mm; the flowering branches with one bract, this early caducous and one bract per flower. Pedicel 0.5—1.5 mm long, sometimes nearly sessile. Bracteoles 2, inserted just below the calyx, 0.5—1 mm long, opposite, spreading. Calyx puberulous to pubescent; cup 1—1.5 mm long and 1—1.5 mm in diameter; vexillary lobe incised, 0.75—1.5 by 0.75—2 mm, the other 3 lobes acute to obtuse, 0.75—1.5 by 0.5—0.75 mm. Standard: blade 2—3 by 3—5 mm, ovate to round, base obtuse

to emarginate, apex emarginate; claw 0.5—1.25 by 0.3 mm. Wing: blade 2—2.5 by 1—1.5 mm, with a dorsal auricle and a lateral pocket; claw 1.5—2 by 0.2 mm. Keel: blade 1.5—2.5 by 1—1.25 mm, with a dorsal auricle and a lateral pocket; claw 1.5—2 by 0.2 mm. Vexillary stamen (1—) 1.5—2.5 mm long. Stamens alternately longer and shorter, respectively (1.5—) 2—3.5 and (1—) 1.5—3 mm long, up to 1/3 connate. Anthers 0.2 mm, the shorter filaments with reduced anthers. Nectary 10-lobed, lobes alternately longer and shorter, glabrous. Ovary pubescent, 0.75—2 by 0.5 mm. Ovules 2, medial. Style glabrous, 1—2 mm long. Stigma minute capitate. Pod light brown pubescent, 6—8 by 1.5—2.5 mm. Seed 16 by 2—3 mm.

DISTRIBUTION: Malay Peninsula, North Borneo, Philippines.

HABITAT: Mixed 'jungle', disturbed or primary forest. Altitude up to 160 m.

FIELD NOTES: Brown hairy, woody climber, up to 45 m. Stem 10—15 cm in diameter. Outer bark smooth, whitish; inner bark pinkish. Sap translucent turning reddish on exposure, sticky pale yellow brown. Flowers yellow or yellow green in bud, red to claret with a white, grey or yellow brown calyx. Pods yellow brown or green (unripe?).

NOTES: 1. In dried state recognizable by the asymmetric lateral leaflets with a fine reticulate-scalariform venation and the small flowers (3 mm long), which are arranged in very regular panicles. As Prain already indicate, the shape of pod and leaflets is not differing very much from *S. ferrugineus*. The flowers of *S. gyrocarpus* are half as large as those of *S. ferrugineus*, and they are not arranged in fascicles. Furthermore the indument is not so rusty-brown. When not in flower these two species are easily distinguished by the secondary nerves which are not terminating in the margin in *S. gyrocarpus*, although they may approach the margin very closely.

2. See also notes on: *S. auricomus*, *S. multiflorus*, *S. ferrugineus*, and *S. pottingeri*.

SPATHOLOBUS HARMANDII Gagn.

S. harmandii Gagn. in Lecomte, Not. Syst. 2 (1911) 368; Gagn., Fl. Gen. 1. -C. 2 (1916) 446. — *Butea harmandii* (Gagn.) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: Harmand 42 (P).

S. compar Craib in Kew Bull. 1927, 62; Craib, Fl. Siam. Enum. 1 (1928) 446; Handerson in Gard. Bull. S. S. 7 (1933) 99. — TYPE: Kerr 9167 (K, E, SAR, SING).

S. sinensis Chun & T. Chen in Chun & How in Acta Phytotax. Sin. 7 (1958) 31. — TYPE: F. C. How 71016 (K, E, P, US).

Indument brown pubescent. Stipules caducous, 1.5—2 by 0.5—1.5 mm. Rachis 3—9 cm long, the ultrajugal part 0.7—1 cm long. Pulvinus 4—8 by 1—3 mm, densely pubescent. Stipellae 1.5—3 by 0.2—1 mm long

persistent, shorter than petiolule. Petiolule 3—6 by 1—2 mm, densely pubescent. Leaves coriaceous, lower surface finely strigose (lens!). Terminal leaflet 4—14 by 1.5—6 cm, elliptic to narrowly elliptic, base round to acute, apex acuminate to caudate, the very apex emarginate. Lateral leaflets symmetric. Midrib raised at lower surface. Secondary nerves 6—15 pairs, not very distinct from venation, terminating diffusely towards the margin. Venation reticulate. Flowers arranged solitary in short branches up to 2 cm; these arranged up to 20 cm long in an axillary panicle; the lateral branches with 2 bracts, these 2 by 0.5 mm; the flowers with 1 bract, this early caducous. Pedicel (0.5—) 1.5—5 mm long. Bracteoles 2, inserted 0.5—2 mm under the calyx, 0.75—1 mm long, not opposite, spreading. Calyx pubescent; cup 2—3 mm long and 1.5—2.5 mm in diameter, vexillary lobe slightly two topped, 1.5—2.5 by 1.5—3 mm, the other 3 lobes obtuse, 1—2.5 by 0.7—1.2 mm. Standard: blade round, 3—5.5 by 3.5—7 mm, base obtuse, apex emarginate; claw 0.5—2 by 0.5 mm. Wing: blade 2.5—4.5 by 1.2—2.5 mm, usually with a dorsal auricle and a distinct lateral pocket; claw 2—3 by 0.2 mm; in bud the apical parts imbricate. Keel: blade 2.5—3.5 by 1—2.5 mm; claw 1—3 by 0.2 mm. Vexillary stamen 1.8—4 mm long. Filaments alternately longer and shorter, respectively (2.5—) 3.5—7 mm and (2—) 3—5.5 mm long, up to about halfway connate. Anthers c. 0.3 mm long, uniform. Nectary 10—lobed, glabrous. Ovary 2 by 0.5—1 mm, pubescent. Ovules 2, apical or in the middle. Style 1—4 mm long, glabrous or up to halfway pubescent. Stigma minute, oblique. Pod yellowish brown pubescent, 6—9.5 by 2—2.5 cm.

DISTRIBUTION: Upper Burma, Laos, Vietnam, S. China, Thailand, Northern part of the Malay Peninsula.

HABITAT: Mixed deciduous forest, roadside hedges, thickets. Sandy soil. On dry slopes, moist ground beside streams, at the foot of mountains. Altitude up to 850 m.

FIELD NOTES: Climber 15 m. Flowers dark red, calyx pale green, anthers yellow, pistil pale green. Pod yellow or green.

NOTES: 1. *S. harmandii* is a species very closely allied to *S. acuminatus*, both in leaflets and in flowers. But the inflorescence is one time less branched, the calyx lobes are slightly narrower; the corolla according to various field notes is dark red and the calyx pale green. The leaves, however, have the best separating characters. The pulvini of *S. harmandii* are very densely pubescent, the leaflets are very thick, the upper surface in bluish grey and the lower surface dull brown (in sicco). This in contrast with the sparsely pubescent pulvini of *S. acuminatus* and the greenish brown coloured leaflets.

2. *S. compar* Craib and *S. sinensis* Chun & Chen are just similar to *S. harmandii*. Chun & Chen already indicated a close relationship with *S. harmandii*.

3. See also the notes on: *S. acuminatus*, *S. crassifolius*, *S. merguensis*, *S. pallidus* and *S. ridleyi*.

Spatholobus hirsutus* Wiriadinata & Ridder-Numan, *spec. nov.

Stipulae persistentiae, 8—15 mm longae, 2—4 mm latae, Folia subtus sparse puberula, nervatura omni subtus prominenti, nervis secundariis 4—8-paribus ad marginem curvatis diffuse terminatis vel arcibus distincte compositis; foliolo terminali elliptico vel elliptice obovate, basi rotundate acuto, apice acuminato, foliolis lateralibus fere symmetricis. Inflorescentia pseudo-paniculata. Bracteoli calyce arote inserti. Calyx puberulus, tubo 2.5—3.5 mm longe, circa 2 mm in diametro, lobis 0.5—1 mm longis, acutis, lobo vexillary emarginato. Antherae uniformes, 0.3 mm longae. Nectarium 10-lobatum, puberulum. — TYPE: *Endert 5162* (holo-, BO, K) *Nieuwenhuis 1317, 1440, 1444* (para-, BO).

Indument light-brown pubescent. Stipules persistent, 8—15 by 2—4 mm. Rachis of leaf 5.5—9 cm long, the ultrajugal part 1—1.5 cm long. Pulvinus 5—7 by 1—3 mm. Stipellae early caducous, 2.5 mm long. Petioles 5—8 by 1—1.5 mm, sparsely pubescent. Leaves chartaceous, upper surface glabrous, lower surface glabrous, lower surface sparsely puberulous. Terminal leaflet elliptic to elliptic-obovate, 9.5—21 by 4—8 cm, base rounded acute, apex acuminate. Lateral leaflets more or less asymmetric, with the basiscopic side more ovate and the base round. Nerves raised at the lower surface. Secondary nerves 4—8 pairs, more or less curved terminating diffusely or forming arches. Venation scalariform. Flowers arranged in fascicles on short stalk; these arranged in axillary/terminally panicles up to 16 cm long; the lateral branches with two bracts, these 4 by 2 mm; the fascicles with one bract, this 2 by 0.5 mm; the flowers with one bract, this 1.5—2 mm long. Pedicel 1—1.5 mm long. Bracteoles 2, inserted just below the calyx, 0.5 mm. Calyx cup 2.5—3.5 mm long and 2 mm in diameter; vexillary lobe often two topped, 0.5—1 by 1.5 mm; the other 3 calyx lobes acute, 0.5—0.8 by 1 mm, more or less spreading. Standard: blade ovate to orbicular, 3.5—4.5 by 3.5—4 mm, base truncate, apex emarginate; claw 0.2—0.7 by 0.5 mm. Wing: blade 3—4 by 1.5—1.8 mm, pubescent at the outside, with a lateral pocket; claw 0.5—1.5 by 0.3 mm. Keel: blade 3—3.5 by 1.5 mm, sometimes with a small lateral pocket and a few hairs at the ventral basal margin; claw 1—1.5 by 0.3 mm. Vexillary stamen 2—3.5 mm long. Filaments alternately longer and shorter, respectively 3—4 and 3.5 mm long, up to about 3/4 connate. Anthers 0.3 mm long, uniform. Nectary 10-lobed, puberulous. Ovary densely pubescent, 1.5 by 0.5—0.7 mm. Ovules 2, apical. Style glabrous or hairy up to about halfway, 2.5—3 mm long. Stigma capitate or flattened. Pod not seen.

DISTRIBUTION: Borneo, W. Kutai (*Endert 5162*). Tawao (*SAN 37132*).

HABITAT: Flat lowland. Primary forest.

NOTES: *S. hirsutus* has completely pubescent wings; even the keel petals have some pubescence on the lower ventral margin, which might be an indication to relationship with *Butea*.

SPATHOLOBUS LATISTIPULUS Merr.

S. latistipulus Merr., Pl. Elm. Born. (1929) 110. — TYPE: *Elmer 21439* (BR, BO, C, K, L, P, SING, U).

Indument puberulous, brown. Stipulate persistent, 11—12 by 7—12 mm, asymmetric, the apex pointed at the rachis. Rachis 5—10 cm long, the ultrajugal part 2—4 cm long. Pulvinus 5—10 by 2—4 mm. Stipellae persistent, 3—7 by 0.5 mm. Petiolule 5—10 by 2—4 mm, Stipellae persistent, 3—7 by 0.5 mm. Petiolule 5—10 by 2—3 mm, glabrous. Leaves chartaceous to coriaceous, upper surface glabrous, under surface minutely sparsely puberulous. Terminal leaflet elliptic to obovate, 11—14 by 6—10 cm, base truncate to cordately round, apex round, very apex abruptly acuminate, mucronate. Lateral leaflets symmetric. Midrib and secondary nerves raised at lower surface. Secondary nerves 10—12 pairs, forming distinct marginal arches. Venation reticulate. Flowers in fascicles, these arranged in axillary or terminally panicles up to 14 cm long; the lateral branches with two bracts, these 2—5 by 1.5—2 mm, reflexed; the fascicles with one bract, this 1 by 0.2 mm; flowers with one bract, this 1 by 0.2 mm. Pedicel c. 2 mm long. Bracteoles 2, inserted c. 0.5 mm below the calyx, 0.7 by 0.1 mm, spreading, not opposite. Calyx sparsely strigose; cup 2 mm long and 2—2.5 mm in diameter; vexillary lobe one topped, 0.5 by 1.5 mm, the other 3 lobes acute, 0.5 by 1 mm. Standard: blade orbicular, 3.5 by 4 mm, base truncate to decurrent, apex emarginate; claw 0.5—1.5 by 0.5 mm. Wing: blade 3 by 1.5 mm, with a small lateral pocket; claw 1.5—3 by 0.2 mm. Keel: blade 2.5—4.5 by 1.5 mm; claw 1.5—3 by 0.2 mm. Vexillary stamen 2—5 mm long. Stamens alternately longer and shorter, respectively 3—6.5 and 2.5—6 mm, connate up to about halfway. Anthers 0.5—6.5 and 2.5—6 mm, connate up to about halfway. Anthers 0.5—1 mm long, uniform. Nectary 5 lobed, glabrous. Ovary 2 by 0.7 mm, pubescent. Ovules 2, medial. Style 4.5 mm long, pubescent up to about halfway. Stigma minute, flat. Pod not seen.

DISTRIBUTIONS N. Borneo, Burma, Merqui Archipelago (*Proudlock 15*), S. Tenasserin (*Parkinson 1696*).

HABITAT: Primary forest, on 'yellow brownish stony' ridge. Altitude 450 m.

FIELD NOTES: Climber. Stem 25 cm in diameter, outer bark brownish, inner bark orangish. Latex colourless. Flowers white.

NOTES: 1. *S. latistipulus* is easily distinguished by the large persistent stipules, which are asymmetric as well. According to Merrill (1929) 'it probably belongs in the group with *S. affinis* (= *S. oblongifolius*) although it is not closely allied to that species'. In our opinion it fits

better in a group with *S. mainyayi* with their sparsely hairy calyx and short calyx lobes.

2. See also notes on *S. viridis*.

SPATHOLOBUS LITTORALIS Hassk.

S. littoralis Hassk., *Flora Beibl.* 25, 2 (1842) 79; Back. & Bakh. f., *Fl. Java.* 1 (1963) 630; Heyne, *Nutt. Pl.* 2 (1916) 329; Miq., *Fl. Ind. Bat.* 1 (1855) 203; Ridl. in *Kew Bull.* 1938, 2778. — *Butea littoralis* (Hassk.) Blatter in *J. Ind. Soc.* 8 (1929) 136. — TYPE: Hassk. Hort. Bog. (?)

? *Derris leytenensis* Merr. in *Philip. J. Sc.* 9 (1914); Merr., *Enum. Philip.* (1923) 310. — TYP9: *Wenzet 841*.

Indument yellow green or dull brown pubescent. Stipules caducous, 4—8 by 1.5—4 mm. Rachis 2.5—11 cm long, the ultrajugal part 0.5—2.5 mm. Pulvinus 4—9 by 1.5—3 mm. Stipellae caducous 1—3 by 0.3—1 mm. Petiolule 3—8 by 1—2 mm, glabrous to minutely puberulous. Leaflets chartaceous, sparsely puberulous on both surfaces (lens!). Terminal leaflet, 7—21 by 2—7.5 cm, elliptic to narrowly elliptic-ovate, base acute, apex acuminate to caudate, mucronate. Lateral leaflets slightly asymmetric; acroscopic side elliptic, narrowly elliptic or narrowly elliptic-ovate, base round to acute, apex acuminate to caudate; basiscopic side ovate to narrowly ovate or narrowly elliptic, base round to acute, acuminate to caudate. Midrib and secondary nerves raised at lower surface of leaflets, venation sometimes slightly raised. Secondary nerves 5—8 pairs, curved towards the margin, terminating diffusely. Venation reticulate. Flowers arranged in short stalked fascicles, these arranged in axillary or terminally panicles up to 15 cm long; the lateral branches with one or two bracts, these 3 by 1 mm, early caducous, the terminal inflorescence often with small uni- or trifoliate bracts; the fascicles with one bract, this 2 by 0.2 mm; the flowers with one bract, this 1 mm long. Pedicel 2—4 mm long. Bracteoles 2, inserted 0.5—2 mm below the calyx, 0.5—1 mm long, not opposite, spreading. Calyx puberulous; cup 2—3 mm long and 2—2.5 mm in diameter; vexillary lobe not emarginate, c. 0.5—1 by 2 mm, the other 3 lobes round to acute, 0.2—0.5 by 1 mm. Standard: blade 4—6 by 4—5.5 mm, round to ovate, base truncate to emarginate, apex emarginate; claw 0.7—1.5 by 0.2—1 mm. Wing: blade 3—5 by 1.5—2 mm, sometimes with a small dorsal auricle and a lateral pocket; claw 1.5—3 by 0.2—0.5 mm. Keel: blade 3—5 by 1—2 mm, with a lateral pocket; claw 1.5—3 by 0.2—0.4 mm. Vexillary stamen 2.5—5 mm long. Stamens alternately longer and shorter, respectively 4—6.5 and 3—6 mm, connate up to about halfway. Anthers 0.5—0.7 mm, uniform. Nectary 10-lobed, glabrous. Ovary 2.5—4 by 0.7—1 mm, densely pubescent. Ovules 2, medial. Style 1.5—4 mm long, glabrous. Stigma flattened or capitate. Pod 7.5—10.5 by 2—3 cm, glabrous. Seed 22 by 18 cm.

DISTRIBUTION: Java, Philippines.

HABITAT: Altitude up to 1100 m.

FIELD NOTES: Flowers white, fragrant.

NOTES: 1. Characteristic for this species in the vexillary lobe which is longer than the other lobes and not emarginate. The fascicles are composed of about 3 flowers on top of a short stalk. Usually the leaflets are narrowly elliptic.

2. Probably *Derris leptensis*, a species from the Philippines, is synonymous to *S. littoralis*. We have not seen any type material, but some additional material in L, identified by Merrill. According to Merrill (1923) it is the same as *S. palawanensis*, which is in our opinion synonymous to *S. macropterus*.

3. See also notes on: *S. albus*, *S. dubius*, *S. latistipulus*, *S. macropterus*, and *S. maingayi*.

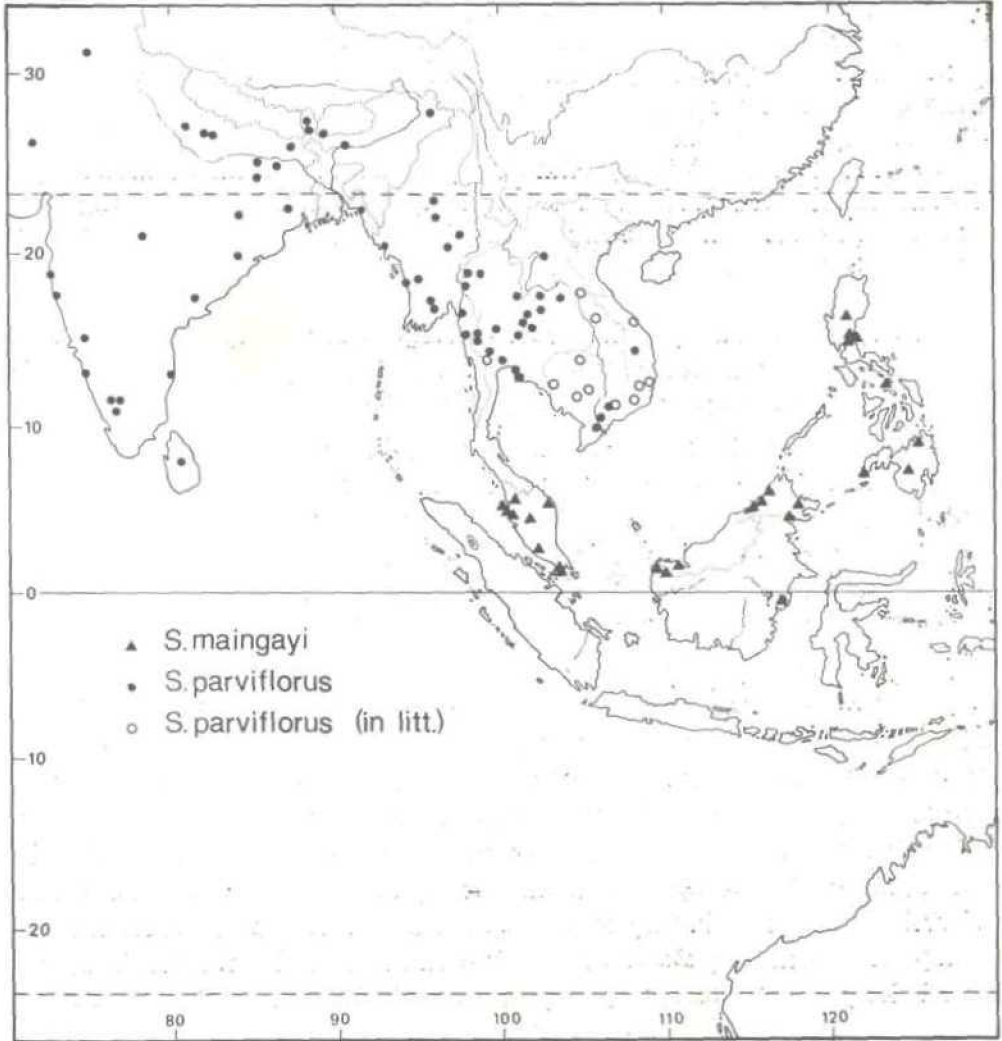
SPATHOLOBUS MACROPTERUS Miq.

S. macropterus Miq., Sum. (1860) 303. — *Butea macropterus* (Miq.) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *Tegsman 4503* (?) [South Sumatra: Prov. Lampung, along the river of Tarabangi] (BO hol., U).

S. palawanensis (Elm.) Merr. Enum. Philip. 2 (1923) 310. — *Derris palawanensis* Elm. in Leaflet. Philip. Bot. 5 (1913) 1800. — TYPE: *Elmer 13063* (L, U).

S. platypterus Merr., Pl. Elm. Born. (1929) 109. — TYPE: *Elmer 21562* (BR, L, K, P, SING, U).

Indument brown pubescent. Stipules early caducous, 12 by 2—5 mm. Rachis (1.5—) 3.5—10 (—13.5) cm long, the ultrajugal part 0.5—2.5 cm long. Pulvinus 4—8 by 1—2.5 mm, sparsely pubescent, black (in sicco). Stipellae caducous, 2—5 by 1—1.5 mm. Petiolule 3—4 by 1—2 mm. Leaves chartaceous to coriaceous, glabrescent; very young leaves sericeous. Terminal leaflet 5—15 by 2.5—7.5 cm, elliptic to elliptic-ovate, base acute, rounded or subemarginate, apex acuminate to caudate, mucronate. Lateral leaflets symmetric. Midrib and secondary nerves raised at lower surface. Secondary nerves 4—8 pairs, curved towards the margin, terminating diffusely. Venation reticulate. Terminal panicles up to 10 cm long; the lateral branches with two bracts these 3—5 by 1—1.5 mm; the fascicles with one bract, this 2—3 by 1—2 mm; the flowers with one bract, this 1—2 by 0.5—1 mm. Pedicel up to 1.5 mm long; flower often nearly sessile. Bracteoles 2, inserted just below the calyx, 0.7—1.5 mm long, adpressed. Calyx pubescent; cup 2.5—3 mm long and 1.5—2.5 mm in diameter; vexillary lobe two topped, 0.7—1.3 by 1.2—2 mm, the other 3 lobes acute to obtuse, 0.5—1 by 1 mm. Standard blade 3.5—4 by 4 mm, ovate to round, base truncate, apex emarginate; claw 0.5—1.5 by 0.5—1 mm. Wing: blade 3—4 by 1.5 mm, with a small dorsal auricle, lateral pocket and often more or less pubescent from the lateral pocket to the ventral margin; claw 0.7—1.7 by 0.3—0.5 mm. Keel: blade 2.5—3.5 by 1.5—2 mm, with a lateral claw 0.7—2 by 0.3—0.5 mm. Vexillary stamen (2—) 3—5 mm long. Stamen alternately



longer and shorter, respectively (2.7—) 4—6.5 and (2—) 3—5 mm long, up to about 2/3 connate. Anthers c. 0.3 mm long, uniform. Nectary 10-lobed, pubescent. Ovary 1.5—2 by 0.3—1 mm, woolly or strigose. Ovules 2, locally. Style 2—4 mm long, glabrous. Stigma capitate. Pod 8—11 by 2.5—4 cm, brown puberulous. Seed c. 1.5 by 1 cm.

DISTRIBUTION: Malay Peninsula, Sumatra, Borneo, Philippines.

HABITAT: Cultivated land, logging area, disturbed forest, evergreen forest, mixed Dipterocarp forest. Kerangas forest, riverbank, side of railway, edges of forest. Yellow clay, loam sandstone or rocky sandstone. Altitude up to 1700 m.

FIELD NOTES: Woody climber up to 35 m. Stem diameter up to 10 cm. Inner bark soft. Red latex. Twigs whitish brown, young twigs brown. Flowers yellow, orange, whitish yellow, white, greenish, turning brown after anthesis. Buds green.

NOTES: 1. The pod has rather large wing compared to those of other species. It is about twice as broad as the apical part. The pubescence on nectary and wing is also very characteristic.

2. *S. macroptera* is very much resembling *S. dubius* with respect to the pubescence of the calyx and the shape of the calyx lobes. In both species the lateral leaflets are more or less symmetric, both midrib and secondary nerves are raised at the lower surface of the leaflets, and also the flowers are arranged in fascicles. But it differs in the shape and pubescence of petals and pod.

3. In our opinion *S. platypterus* is conspecific with *S. macropterus*. According to Merrill this species is very closely allied to *S. littoralis*, but he does not give any arguments. The leaflets of *S. littoralis* resemble those of *S. macropterus* in texture, but they narrower. Further there are many differences in the type of fascicles, the pubescence on calyx and wing and nectary and the shape of the calyx lobes and petals. Another synonym of *S. macropterus* is in our opinion *S. palawanensis* (Elm.) Merril. But not including *S. philippinensis* which was in Merrill's view conspecific with *S. palawanensis*. We think that the former is distinct and belongs to *S. maingayi*, a species closely related to *S. littoralis*.

4. See also notes on: *S. albus*, *S. littoralis*, *S. purpureus*, and *S. ridleyi*.

SPATHOLOBUS MAINGAYI Prain ex King.

S. maingayi Prain ex King in J. As. Beng. 66, 2 (1897) 79; Burk. & Hend. in Gard Bull. S. S. 3 (1925) 366. Ridl., Fl. Mal. Pen. 1 (1922) 575. — *Butea maingayi* (Prain ex King) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *Maingayi*

611 (K, L, Lecto-), *Kunstler 3535* (K, U, syn-), *Kunstler 4652* (K, SING, syn-) *Kunstler 16428* (K, L, P, syn-), *Scortechini 206* (K, syn-), *Scortechini 1537* (K, syn-).

S. Philippinensis Merr. in *Philip. J. Sc.* 13 (1918) Bot. 17; Merr., *En. Philip.* 2 (1923) 310. — *Butca philippinensis* (Merr.) Blatter in *J. Ind. Soc.* 8 (1929) 137. — TYPE: *FB 26841* (Mabesa) (K, P).

S. apocensis Elm. in *Leaf. Philip. Bot.* 2 (1910) 698; Merr. *En. Philip.* 2 (1923) 310. — *Butca apocensis* (Elm.) Blatter in *J. Ind. Soc.* 8 (1929) 135. — TYPE: *Elmer 11795* (BO, E, K, L, P, U).

S. strigillifer Ridl. in *Kew Bull.* 1929, 254. — TYPE: *Ridley s.n.* (Matang, Jan. 1915) (K).

Indument sparsely pubescent to puberulous, light brown. Stipules caducous, 2 mm long. Petiolule 4—10 by 1—2 mm, glabrous. Leaves chartaceous to coriaceous, glabrous to sparsely puberulous (lens!). Terminal leaflet 4—14.5 by 2.5—9 cm, elliptic to ovate, sometimes nearly circular, base round to acute, apex acute to acuminate, the very apex sometimes abruptly acuminate, mucronate. Lateral leaflets slightly asymmetric; acroscopic side elliptic, base round to acute, apex acute to acuminate; basiscopic side elliptic to ovate, base round to acute, apex acute to acuminate. Midrib and secondary nerves 5—10 pairs, curved towards the margin, terminating diffusely. Venation reticulate. Flowers in fascicles or nearly in fascicles, these arranged in axillary or terminally panicles up to 32 cm long; the lateral branches with one bract, this 2—7 by 1.5—2 mm; the fascicles with one bract, this 1—1.5 by 0.2 mm; the flowers with one bract, this 0.7 by 0.1 mm. Pedicel 1—3 mm long. Bracteoles, inserted 1.5 mm to just below the calyx, 0.3—1 mm long, spreading, opposite. Calyx sparsely puberulous; cup 2—3 mm long and 1.5—2.5 mm in diameter; vexillary lobe on or slightly two topped, 0.2—0.7 by 1.5—3 mm, the other 3 lobes rounded to acute, 0.2—0.5 by 0.8—1 mm. Standard: blade broadly ovate, 3—6 by 4—6 mm, base emarginate to decurrent, apex emarginate; claw 1 to 0.3—1.5 mm. Wing: blade 2.5—4.5 by 1—2 mm, with a dorsal auricle and a lateral pocket; claw 1.7—2.5 by 0.2 mm. Keel: blade 2.5—5 by 1—1.5 mm; claw 2—2.5 by 0.2 mm. Vexillary stamen 3—4.5 mm long. Stamens alternately longer and shorter, respectively 4—5.5 and 3—4.5 mm long, connate up to about halfway. Anthers 0.5—0.8 mm long, uniform. Nectary 10 lobed, glabrous. Ovary 2—3.5 by 0.5—1 mm, densely pubescent. Ovules 2, about medial. Style, 1.5—2.5 mm long, glabrous or up to halfway pubescent. Pod 7.5 by 2 mm, glabrous.

DISTRIBUTION: Malay Peninsula, Borneo, Philippines.

HABITAT: In rather open forest, primary forest, and along roads and stream. Rocky places. Altitude up to 600 m.

FIELD NOTES: Woody climber up to 25 m high. Leaves glossy bright green, dark green or bluish green above, yellowish green below. Flowers white to pink with a cream to grey calyx.

NOTES: 1. *S. maingayi* is closely related to *S. littoralis*. Like in *S. littoralis* the calyx lobes are very short and rounded, but the vexillary lobes in only occasionally exceeding the other 3 as is constantly the case in *S. littoralis*. Often the flowers are arranged in stalked fascicles as in *S. littoralis*. The leaflets are not so narrow, glabrous, the pubescent on the calyx is very sparse, the anthers are twice as long, and the pod is much shorter. *S. maingayi* had not yet been reported in fruit when Prain described it, but by the presence of stipules he concluded it might be a *Spatholobus* and not as *Aganope* (*Derris macrophylla*) as Father Scortechini thought according to his notes.

2. Synonymous to *S. maingayi* are *S. apoensis* and *S. strigillifer*. Ridley states that *S. strigillifer* is very near *S. roseus* (= *S. acuminatus*), but on our opinion this species differs not only in flowers, but also in shape and texture of the leaflets and pod. The differences with 'typical' *S. maingayi* are only a slightly different venation and smaller anthers. But after finding some intermediates the conclusion seems justified, that these two names are synonyms. The same holds for *S. apoensis*, which seemed to be different only in its slightly larger flowers, which are not arranged in distinct fascicles. When Elmer described *S. apoensis* the fruits were not yet known and therefore he had 'some doubts as to the rightful genus'.

3. The calyx of this species is of a rather thick texture. After boiling up it was not possible to spread out the calyx, because it tended to break apart very irregularly.

4. See also notes on: *S. dubius*, *S. latistipulus*, *S. macropterus*.

SPATHOLOBUS MERGUENSIS Prain

S. merguensis Prain in J. As. Soc. Beng. 66, 2 (1897) 416. — *Butea merguensis* (Prain) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: Prondlock 15 (K), Anderson (s.n. ?, n.v.) (Mergui Archipelago).

Indument light brown puberulous. Stipules early caducous, 5 by 2 mm. Rachis 2—3.5 cm long, the ultrajugal part up to 0.5 cm long. Pulvinus 1 by 2 mm. Stipulae caducous, not seen. Petiolule 7 by 2 mm, glabrous. Leaves coriaceous, glabrous; young leaves membranous. Terminal leaflet oblong-elliptic, 13—18 by 5.5—6 cm, base acute, apex acute, very apex slightly emarginate. Lateral leaflets more or less symmetric. Midrib raised at lower surface of leaflets. Secondary nerves 6—11 pairs, not much ascending terminating diffusely. Venation reticulate. Flowers arranged on short branches up to 1.5 cm long, these arranged in panicles up to 35 cm long; the lateral branches with 2 bracts, these 3.5 by 1.5 mm, the bract of flower bearing branches and

flowers not seen. Pedicel 1 mm long. Bracteoles 2, inserted just below the calyx, 0.5 mm long. Calyx puberulous; cup about 2 mm long and 2.5 mm in diameter; vexillary lobe very slightly emarginate, 1.5 by 2 mm; the other 3 lobes rhomboid, 1.5 by 1 mm. Standard: blade broadly elliptic, 4 by 4.5 mm, base emarginate, apex emarginate; claw 1 by 0.5 mm. Wing: blade 3 by 1.5 mm, with a lateral pocket; claw 2 by 0.2 mm. Keel: blade 3 by 2 mm, with a lateral pocket; claw 2.5 by 0.2 mm. Vexillary stamen 3.5 mm long. Stamens alternately longer and shorter, respectively 5 and 3.5—4 mm long, up to about halfway connate. Anthers 0.2 mm long, uniform. Nectary 10-lobed, glabrous. Ovary 3 by 0.7 mm. Ovules 2, medial. Style 2 mm long, glabrous. Stigma minute, capitate. Pod not seed.

DISTRIBUTION: Mergui Archipelago, S. Tenasserim.

HABITAT: Altitude 60 m.

NOTES: 1. The flower resembles those of *S. harmandii* and *S. acuminatus*, but the leaflets are different. They are thick coriaceous and oblong, and only the midrib is raised at the lower surface. Just like *S. oblongifolius* (and *S. bracteolatus* in a lesser extend) the rachis is not elongated beyond the lateral pair of leaflets. The leaves are thicker than those of *S. oblongifolius* and the nervation is more horizontal. The flower of *S. oblongifolius* is longer, the calyx lobes narrower, and the ovary shorter.

2. See also notes on: *S. acuminatus*.

Spatholobus multiflorus* WIRIADINATA & RIDDER-NUMAN, *spec. nov.

Stipulae mox deciduous. Folia subtus dense pubescentia vel sericea, costa nerviis secundariisque subtus prominentibus, 9—14 paribus, arcibus marginalibus distincte compositis; foliolo terminali elliptico, basi rotundate acute, apice acuminato, foliolis lateralibus asymmetricis, lateri basiscopico ovato, acroscopico, elliptico arcte inserti. Calyx sericeus, tubo circa 1 mm longo, 1.5 mm in diametro, lobis 0.5—1 mm longis, acutis, lobo vexillari paulo emarginato, lobis 0.5—1 mm longis, acutis, lobo vexillari paulo emarginato. Antherae uniformes, circa 0.2 mm longae. Nectarium 10-lobato, glabro. — TYPE: *S. 32370* (BO-holo, K, L, flower), *Puasa 4848* (BO, K, SING, fruit).

Indument yellow brown sericeous. Stipules caducous, 10—16 by 4 mm. Rachis 4—8.5 cm, the ultrajugal part up to 1.2 cm long. Pulvinus 7 by 3 mm, pubescent. Stipulae caducous, 5—8 by 1 mm, longer than petiolule. Petiolule 4—6 by 2 mm, pubescent. Leaves coriaceous, upper surface glabrescent with pubescent nerves lower surface densely pubescent or sericeous. Terminal leaflet 8—9 by 4—4.5 cm, elliptic, base rounded acute, apex acuminate, mucronate. Lateral leaflets slightly asymmetric; acroscopic side elliptic to obovate, base acute, apex

acuminate; basiscopic side ovate, base rounded acute, apex acuminate. Midrib and secondary nerves raised at lower surface of leaflets. Secondary nerves 9—14 pairs, forming distinct marginal arches. Venation reticulate. Flowers arranged in fascicles, these arranged in panicles up to 15 cm long; the lateral branches with two bracts, these 4—6 by 2 mm; the fascicles with one bract, this 3—4.5 by 1—1.5 mm, the flowers with one bract, 1.5 mm long. Pedicel 0.2—1 mm long. Bracteoles 2, inserted just below the calyx, 0.5 mm long, opposite, adpressed. Calyx sericeous; cup c. 1 mm long and 1.5 mm in diameter; vexillary lobe slightly emarginate, 0.5—1 by 1—1.5 mm; the other 3 lobes acute, 0.5—1 by 0.7—1 mm. Standard: blade 2 by 3 mm, broadly elliptic, base emarginate, apex emarginate; claw 0.2 by 0.2 mm. Wing: blade 1.5—2 by 1 mm, with a dorsal auricle, a small lateral pocket and sometimes a small ventral auricle; claw 0.5—1 by 0.2 mm. Keel: blade 1.5 by 1 mm, with a dorsal auricle and a small lateral pocket; claw 0.5—1 by 0.2 mm. Vexillary stamen 1 mm long. Stamens alternately longer and shorter, respectively 1.2—2 mm and 1—1.5 mm long, up to about halfway connate. Anthers c. 0.2 mm, uniform. Nectary 10-lobed, glabrous. Ovary 1.5 by 0.5 mm, pubescent. Ovules 2, medial. Style 0.5—0.8 mm long, glabrous. Stigma minute, capitate. Pod 8 by 2.5 mm.

DISTRIBUTION: N. Borneo. Sabah (4 coll.); Limbang (*S. 32370*).

HABITAT: Seashore, river bank, on gentle slopes. Altitude up to 200 m.

FIELD NOTES: Woody climber up to 20 m and stem 21 cm in diameter. Bark blackish, inner bark white, producing red latex. Lower surface of leaves slightly glaucous. Peduncle light green, calyx white or yellow, corolla dark reddish brown or red. Filaments white, anthers bright yellow, style light green.

NOTES: 1. This species is easily recognizable by the very small flowers (up to 4 mm long) and the densely sericeous or pubescent leaf lower surface, the marginal arches formed by the secondary nerves and the conspicuous stippelae. The angle between the midrib and the secondary nerves is more than 45° , which gives the leaflets a very different appearance than those of *S. auricomus*, which resembles *S. multiflorus* in other respects. Both have a sericeous indument at the lower surface of the leaflets, but the indument of *S. multiflorus* is dull. Both species have similar small flowers as *S. gyrocarpus*. The leaflets of *S. multiflorus* are of the same type as those of *S. persicinus*: a dull sericeous pubescence beneath, very regular secondary nerves which form marginal arches and at the one side emarginate base of the lateral leaflets.

2. See also notes on *S. acuminatus*.

SPATHOLOBUS OBLONGIFOLIUS Merr.

S. oblongifolius Merr. in Philip. J. Sc. 11 (1916) 90; Merr. in J. Str. Br. R. As. Soc. spec. number (1921) 310. *Butea oblongifolia* (Merr.) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *Hose* 486 (K, L, E).

S. affinis Merr. in Philip. J. Sc. 11 (1916) 90; Merr., J. Str. Br. R. As. Soc. spec. number (1921) 310. *Butea affinis* (Merr.) Blatter in J. Ind. Soc. 8 (1929) 136. — TYPE: *Hose* 632 (K, L, E).

Indument strigose or hispid. Stipules early caducous, 12 by 2.5—4 mm. Rachis 2.3—22 cm long, the ultrajugal part up to 1.5 mm long. Pulvinus 6—15 by 3—5 mm. Stipellae caducous, 5—19 by 0.2 mm. Petiolule 6—13 by 2—3 mm minutely puberulous. Leaves coriaceous, glabrous. Terminal leaflet 11.5—31 by 4—14 cm, narrowly elliptic to obovate, base acute, apex acute to acuminate, the very apex often mucronate. The lateral leaflets asymmetric; acroscopic side narrowly elliptic, base acute, apex acute to acuminate; basiscopic side elliptic to elliptic-ovate, base acute, apex acute to acuminate. Midrib and secondary nerves raised at lower surface. Secondary nerves 8—9 pairs, looped towards the margin, ending diffusely. Venation reticulate. Flowers in short branches, these arranged in axillary panicles, up to 25 cm long; the lateral branches with one bract, this 12 by 5 mm; the flower bearing branches with one bract, this 2 by 0.5—1 mm; the flower with one bract, this 1—1.5 mm long. Sometimes several panicles arise from one leaf axil on a short branch, then panicle with one bract 17 by 3 mm. Pedicel 1.5—3 mm long. Bracteoles 2, subulate, 0.5—1.5 mm inserted under calyx, 0.5 mm long, sub-adpressed, caducous. Calyx pubescent; cup 2—3 mm long and 2 mm in diameter; vexillary lobe two topped, 2 by 1.5—2 mm; the other 3 lobes obtuse, 1 by 1.5—2 mm. Standard: blade ovate-orbicular, 4—5 by 4—6 mm, base obtuse to decurrent, apex emarginate; claw 1—3 by 0.25 mm. Wing: blade 3—4 by 2—2.5 mm, with a small lateral pocket; claw 0.5—3 by 0.25 mm. Keel: blade 3—4 by 1.5—2.5 mm, with a small lateral pocket; claw 0.5—3 by 0.25 mm. Vexillary stamen 5—6 mm long. Filaments in pairs larger towards the ventral side, 4.5—7 mm long, connate up to 2/3. Anther about 0.2 mm, uniform. Nectary 10-lobed, glabrous. Stigma flattened or capitate. Pod light yellowish brown puberulous (dried state), 5.5—8 by 1.5—2 cm. Seed 5.5 by 4 mm.

DISTRIBUTION: North Borneo.

HABITAT: In primary and old secondary forest on sandy soil and sandstone, on hill ridges and along rivers. Locally common. Altitude up to 1000 m.

FIELD NOTES: Big woody climber, up to 30 m high. Stem 5—10 cm in diameter. Bark white, innerbark red, sapwood white; slightly red exudate from the innerbark. Flowers pinkish white, dull red purple or red green, fragrant. Sometimes symbiosis with ants in the stem.

NOTES: 1. In dried state recognizable by the very short ultrajugal part of the rachis, the black petiolules and the large narrowly obovate leaflets. In contrast with the robust leaves and relatively large flowers, the pod is very tiny, small, and with a nearly translucent wing.

2. See also notes on: *S. acuminatus*, *S. bracteolatus*, *S. latistipulus*, and *S. merguensis*.

SPATHOLOBUS PALLIDUS Craib

S. pallidus Craib in Kew Bull. 1928, 62; Craib, Fl. Siam. Enum. 1 (1928) 447. — TYPE: *Kerr 12317* (E. K).

Indument pubescent, light brown. Stipules caducous, scar 1.5 mm wide. Rachis 2.5—8 cm long, the ultrajugal part 0.5—1 cm long. Pulvinus 5—7 by 2—3 mm. Stipullae caducous, 2 mm long. Petiolule 4—6 by 1 mm, glabrous. Leaves coriaceous, upper surface glabrous, lower surface glabrescent, sparsely puberulous (lens!) when young; leaflets with pellucid dots. Terminal leaflet elliptic-ovate, 10 by 4 cm, base round to subcordate, apex acuminate. Lateral leaflets symmetric. Midrib raised at lower surface. Secondary nerves 7—11 pairs, curved towards the margin, terminating diffusely. Venation reticulate. Flowers arranged solitary on short branches up to 1 cm long, these arranged in panicles up to 12 cm long; the lateral branches with one bract, only scars seen; the flowers with one bract, 1.5 by 0.1 mm. Pedicel 2—3 mm long. Bracteoles 2, inserted 2 mm under the calyx, 2 mm long, early caducous. Calyx puberulous; cup 2.5 mm long and 2 mm in diameter; vexillary lobe two topped, 1.5 by 2 mm; the other 3 lobes 1.5 by 1 mm, obtuse. Standard; blade broadly ovate, 3 by 4 mm, base decurrent, apex emarginate; claw 0.2 by 0.5 mm. Wing: blade 2.5 by 1.8 mm, with a dorsal auricle; claw 0.5 by 0.2 mm. Keel: blade 2.5 by 1.5 mm; claw 0.5 by 0.2 mm. Vexillary stamen 1.5 mm long. Stamens alternately longer and shorter, respectively 2 and 1.5 mm, up to about halfway connate. Anthers 0.2 mm, uniform. Nectary 10-lobed, glabrous. Ovary 2 by 0.5 mm, densely pubescent. Ovules 2, medial. Style 1 mm long, glabrous. Stigma capitate. Pod not seen.

DISTRIBUTION: *S. Thailand* (Surat, Ta Kanawn), once collected.

HABITAT: Evergreen forest. Altitude under 50 m.

NOTES: 1. *S. pallidus* resembles *S. harmandii* and *S. acuminatus* in the texture of the leaflets and the shape of the calyx lobes. It differs in having glabrous pulvini and petiolules, the lower surface of the leaflets not dull brown, and pellucid dots in the leaflets. The leaflets are greyish-green. Only the type specimen (*Kerr 12317*) is known, with the flowers in bud.

2. See also notes on: *S. acuminatus*.

SPATHOLOBUS PARVIFLORUS (Roxb. ex DC.) O. Kuntze

S. parviflorus (Roxb. ex DC.). Kuntze, *Rev. Gen.* (1891) 205; Craib, *Fl. Siam. Enum.* 1 (1928) 447; Thuan, *Fl. Laos, Camb. & Vietnam* 17 (1979) 102. — *Butea parviflora* Roxb. ex DC., *Prod.* 2 (1825) 415; Blatter in *J. Ind. Soc.* 8 (1929) 137; G. Don, *Gen. Syst.* 2 (1832) 373; Wall., *Cat.* 5440; Wight, *lc.* 1 (1839) t. 210. — *S. roxburghii* Benth. in *Miq., Pl. Jungh.* (1852) 238 (nom. superfl.); *Miq. Fl. Ind. Bat.* 1 (1855) 205; Baker in *Hook. f., Fl. Br. Ind.* 2 (1876) 193; Gagnep., *Fl. Gen. I.-C.* 2 (1916) 443. — TYPE: *Herb. Roxb.* (BRLU).

S. roxburghii var. *denudatus* Baker in *Hook.f., Fl. Br. Ind.* 2 (1876) 193. — TYPE: *Wallich 5442 pp.*

S. roxburghii var. *platycarpus* Baker in *Hook.f., Fl. Br. Ind.* 2 (1876) 193. — TYPE: ...?...

Indument velutinous, light greyish yellow or greyish green. Stipules early caducous, scar 4—6 wide. Pulvinus 5—10 by 2—5 mm. Stipellae caducous, 2—6 by 0.5—1 mm. Petiolule 5—9 by 2—4 mm, puberulous to pubescent. Leaves coriaceous, glabrescent. Terminal leaflet 14—24 by 6.5—18 cm, elliptic-ovate to elliptic-obovate, sometimes rather narrow, sometimes suborbicular, base acute to obtuse, apex acute to acuminate, sometimes caudate, mucronate, the very apex sometimes emarginate. Lateral leaflets strongly asymmetric; acroscopic side narrowly elliptic to narrowly obovate, base obtuse to acute, apex round to slightly caudate; basiscopic side ovate, base acute to obtuse, apex round to slightly caudate. Nerves raised at lower surface of leaflets. Secondary nerves 7—9 pairs, curved towards the margin, terminating diffusely. Flowers in fascicles, these arranged in axillary or terminally panicles up to 40 cm long; the lateral branches with two bracts, these 3.5—5 by 2.5—3 mm; the fascicles with one bract, this c. 3 by 1 mm; the flowers with one bract, this c. 3 mm long. Pedicel 2—3 (—4) mm long. Bracteoles 2, inserted just below the calyx, (1—) 2—3 mm long, subadpressed. Calyx puberulous; cup (2—) 3—4 (—5) mm long and (1.5—) 2—4 mm in diameter; vexillary lobe one or slightly two topped, (2—) 3.5—4 by 3—4 (—5) mm; the other 3 lobes 2—4 by 1—1.5 mm, narrowly acute with lateral grooves near either margin. Standard: blade ovate, 5—6 by 5.5—8 mm, base truncate to slightly decurrent, apex emarginate to round; claw 2—3 by 0.5—1.5 mm. Wing: blade 5—7.5 by 2—3 mm, usually with a dorsal auricle and a lateral pocket; claw 3—4 by 0.3—0.8 mm. Keel: blade 4—5 by 2—2.5 mm, usually with a small lateral pocket and a small dorsal auricle; claw 3—4 by 0.3—1 mm. Vexillary stamen 4—7 mm long. Stamens alternately longer and shorter, respectively (5.5—) 7—8 (—9) mm and (5—) 6—7 (—8) mm long, up to 3/4 connate. Anthers 0.3—0.5 mm long. Nectary 10-lobed, glabrous. Ovary 1.5—2 by 0.7—1 mm, tomentose, with longer hairs dorsally. Ovules 2, basal, sometimes partly overlapping. Style 5—7 mm long, glabrous. Stigma flattened, oblique. Pod 9—15 by 2—4 cm, dark brown pubescent. Seed 1.9—2.3 by 1.3—1.5 cm.

DISTRIBUTION: Continental Asia South of the Himalayas from W. India to Laos. Only once found south of the Isthmus of Kra (*Wallich 5442* p.p.), which might have been added later from a different locality, as the remainder represents *S. gyrocarpus*.

HABITAT: Secondary and dry Dipterocarp forest, mixed deciduous and dry evergreen forest, open thickets. On planes, slopes. Sandy soil, laterite and clay soil, limestone. Altitude up to 1675 m. Annual rainfall 3 m.

FIELD NOTES: Liana, 'enormous climber very desctructive to trees' leaning shrubs or trees, up to 25 m or to the tops of the tallest trees. Stalkes cylindrical, slightly angled, 25 cm in diameter, smooth dark grey. Cortical tissue of stem exceeding a red stringet gum. Inflorescences tan to ochrish brown. Large terminal panicles. Flowers white grey, white, cream or pinkish white. Pods reddish brown velvety. Glasslike hardened resin on wounds of some pods.

NOTES: 1. A very distinguishable species with relative large flowers and pods and a greyish-green pubescence (in sicc.) on flowers, stems and leaves. The lateral leaflets are strongly asymmetric.

2. Very characteristic for *S. parviflorus* is the resemblance of the leaflets in shape and texture to *Butea monosperma* and *B. superba*. The pod, although smaller, resembles a *Butea*-pod (a robust wing, not glabrescent).

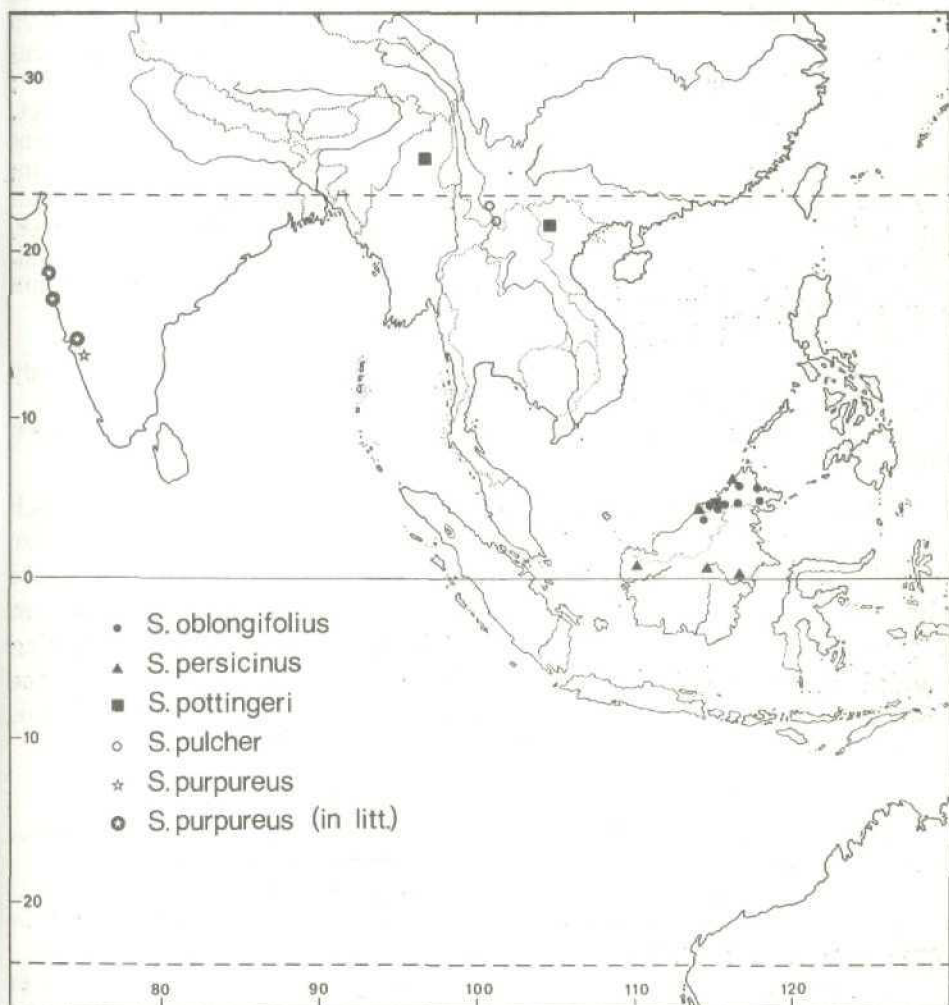
3. Baker described two varieties: *S. roxburghii* var. *denudates* and *S. roxburghii* var. *platycarpus*. The first has nearly glabrous leaflets. This is in our opinion not unusual within *S. parviflorus*. The second variety has very wide fruits (5 cm). This is probably a misidentification of a *Butea superba*, which is also a liana.

4. See also notes on: *S. bracteolatus*, *S. pulcher*, and *S. suberectus*.

SPATHOLOBUS PERSICINUS Ridl.

S. persicinus Ridl. in Kew Bull. 1936, 278. — TYPE: Motley 734 (K).

Indument rusty brown puberulous. Stipules caducous, (1.7—) 7—10 by (6—) 3—4 mm. Rachis 2.1—11.5 cm long, the ultrajugal part 0.1—2.2 cm long. Pulvinus 5—7 by 2 mm. Stipellae caducous, 2 by 0.5 mm. Petiolule 4 by 1.5 mm puberulous. Leaves coriaceous, upper-surface glabrous except for the midrib and secondary nerves, which fire tomentose; lower surface puberulous. Terminal leaflets 8—8.5 by 4—4.5 cm, elliptic, base emarginate to acute, apex suddenly acuminate, the very apex mucronate. Lateral leaflets slightly smaller, asymmetric at the base, acroscopic side base acute to round; basiscopic side with emarginate base. Nerves raised at lower surface. Secondary nerves 11—12 pairs, forming distinct marginal arches. Venation reticulate-scalariform. Flowers in 1—3 flowered fascicles, these arranged in



axillary or terminally panicles; the lateral branches with two bracts, these 6 by 4 mm, the fascicles with one bract, this 2.5 by 0.5 mm, and one bract per flower. Pedicel 1 mm long. Bracteoles 2, 1 mm long, inserted just below the calyx, adpressed, early caducous. Calyx velutinous inside; cup 2—3 mm long and 2—3 mm in diameter; vexillary lobe one or very slightly two topped, 0.75—1 by 2—3 mm; the other 3 lobes acute, 0.5—1 by 1—2 mm. Standard: blade elliptic-ovate to ovate, 4—6 by 3—5 mm, base obtuse, apex emarginate; claw 0.15—0.75 by 0.25—0.5 mm. Wing: blade 4—4.5 by 2—2.5 mm, without lateral pocket, with dorsal auricle and sometimes also with ventral auricle; claw 1 by 0.25 mm. Keel: blade 3—4 by 2.5 mm, without lateral pocket, dorsal auricle; claw 1.25 by 0.25 mm. Vexillary stamen 2.5—3.5 mm long. Filaments alternately longer and shorter, respectively 3—4.5 mm long and 2.5—3.5 mm long, up to halfway connate. Anthers 0.5—0.75 mm long, uniform. Nectary 10—lobed, lobes alternately longer and shorter, glabrous. Ovary sericeous, 2.5—3 by 0.75 mm, ovules 2, nearly basal. Style glabrous from halfway up to the top, 0.5—1.5 mm long. Stigma capitate. Pod not seen.

DISTRIBUTION: Borneo.

HABITAT: Secondary forest, from hillsides and near estuary on sandy soil. Altitude about 25 m.

FIELD NOTES: Flowers rose or dirty pale purple with a pale brown calyx.

NOTES: 1. In dried state the plant is recognizable by the peach like indument on the lower surface of the leaflets, the very regular nervation and the robust flowers with a wide calyx cup and short acute calyx lobes. *S. auritus* has the same kind of leaflets; the flowers are of the same size as those of *S. persicinus*, but they differ in having rounded calyx lobes. The most striking difference however are the persistent stipules, which are about twice as long as those of *S. persicinus*.

2. See also notes on: *S. auritus*.

SPATHOLOBUS POTTINGERI Prain

S. pottingeri Prain in J. As. Soc. Beng. 67, II (1898) 286. — *Butea pottingeri* (Prain) Blatter in J. Ind. Soc. 8 (1929) 137. — TYPE: *Pottinger s.n.* (K).

S. balansae Gagn. in Lecomte, Not. Syst. 2 (1911) 368; Gagn., Fl. Gen. I. — C. 2 (1916) 444. — *Butea balansae* (Gagn.) Blatter in J. Ind. Soc. 8 (1929) 135. — TYPE: *Balansa 3141* (K, P).

S. spirei Gagn. in Lecomte, Not. Syst. 2 (1911) 370; Gagn., Fl. I.-C. 2 (1916) 444. — *Butea spirei* (Gagn.) Blatter in J. Ind. Soc. 8 (1929) 137. — TYPE: *Spire 1007* (P).

Indument brown pubescent. Stipules caducous, not seen. Rachis c. 11.5 cm long, the ultrajugal part 3 cm long. Pulvinus 13 by 5 mm. Stipulae longer than petiolule. Petiolule 7 by 3 mm, hirsute. Leaves coriaceous, yellowish pubescent. Terminal leaflet 19 by 12 cm, elliptic,

base acute, apex abruptly acuminate, mucronate. Lateral leaflets asymmetric side elliptic, base acute, apex abruptly acuminate; basis-copic side ovate, base obtuse, apex abruptly acuminate. Nerves raised at lower surface. Secondary nerves 10—12 pairs, forming marginal arches. Venation reticulate-scalariform. Flowers arranged solitary in short branches up to 2 cm, these arranged in axillary or terminally panicles up to 25 cm long; the lateral branches with 2 bracts, these 10 by 4—5 mm; the flower bearing branches with 1 bract, this 4—5 by 1—2 mm; flowers with 1 bract, this 4 mm long. Pedicel 0.5—1.5 mm long. Bracteoles 2, inserted c. 0.5 mm below the calyx, 1 mm long, spreading. Calyx strigose; cup 2.5—3 mm long and 3 mm in long and 3 mm in diameter; vexillary lobe two topped, 1.5 by 2.5 mm, the other 3 lobes obtuse, 1.5—2 by 1—1.5 mm. Standard: blade 4.5 by 5 mm, orbicular, base decurrent, apex emarginate; claw 1.5 by 0.25 mm. Wing: blade 4 by 1.5 mm, the apical parts of the wings imbricate; claw 2 by 0.3 mm. Keel: blade 3 by 1.5 mm; claw 2 by 0.3 mm. Vexillary stamen 4.5 mm long. Filaments alternately longer and shorter, respectively 5.5 and 4.5—5 mm, up to about halfway connate. Nectary indistinct. Anthers alternately larger and smaller, respectively 0.3—0.5 and 0.15—0.3 mm. Ovary 2—2.5 by 0.5—0.8 mm, pubescent. Ovules 2 (—3), apical. Style 3 mm long, glabrous. Pod not seen.

DISTRIBUTION: N. Thailand, N. Laos.

HABITAT: In forests. Altitude c. 700 m.

FIELD NOTES: A slender creeper, 5—6 m long. Leaves fussy bright green, younger leaves tinged with red. Bud light brown.

NOTES: 1. *S. pottingeri* combines the obtuse-lobed-flower (similar to *S. acuminatus*) with the foliolage of *S. ferrugineus* and *S. gyrocarpus*. The lateral leaflets are asymmetric and the nerves raised at the lower surface. Also in common with the two mentioned species *S. pottingeri* has anthers which are alternately reduced, although probably not sterile.

2. Synonymous with *S. pottingeri* we regard *S. balansae* and *S. spirei*.

3. See also notes on: *S. acuminatus*.

SPATHOLOBUS PULCHER Dunn

S. pulcher Dunn in J. Linn. Soc. Bot. 35 (1903) 489; *Butca pulchra* Blatter in J. Ind. Soc. 8 (1929) 137. — TYPE: A. Henry 12780 (K, E).

Indument brown hirsute. Stipules caducous, 5 by 4 mm. Rachis (2—) 5—10.5 cm long, the ultrajugal part 1.2—2.3 cm long. Pulvinus 3—7 by 1—2.5 mm. Stipellae caducous, 1.5—4 by 0.15 mm. Petiolule 3—4 by 1.5—2 mm, hirsute. Leaves chartaceous, upper surface glabrescent, nerves tomentose, lower surface hirsute; young leaves sericeous. Terminal leaflet 4—13 by 2.5—8.5 cm, elliptic to obovate, base acute to obtuse, apex round, the very apex mucronate to emarginate. Lateral leaflets asymmetric; acroscopic side elliptic base round, apex acute to round; basis-copic side ovate, base round, apex acute to round. Midrib

and secondary nerves raised slightly at lower surface. Secondary nerves 4—7 pairs; looping towards the margin, sometimes forming more or less distinct marginal arches. Venation reticulate. Flowers in short branches, up to 1.5 cm long, these arranged in axillary or terminally panicles up to 45 cm long; the lateral branches with two bracts, these 3 by 1 mm; the short branches with 1 bract, this 2 by 1 mm; the flowers with 1 bract, this 1.5 by 0.25 mm. Pedicel 1.5—5 mm long. Bracteoles 2, subulate, 1 mm long, inserted just below the calyx, adpressed, persistent when flowering. Calyx velutinous inside; cup 2.5—4 mm long and 2—2.5 mm in diameter; vexillary lobe one topped, 1—3 by 1.5—2 mm; the other 3 lobes acute, 1—1.5 by 1.25—2 mm. Standard: blade elliptic to ovate, 4—5 by 4—5.5 mm, base obtuse to decurrent, apex emarginate; claw 2 by 0.25 mm. Wing: blade 4—5 by 1—3 mm, with dorsal and sometimes also a ventral auricle and a small lateral pocket; claw 2.5—3 by 0.25—0.3 mm. Keel 3—4 by 2—2.5 mm, with a small lateral pocket; claw 2.5—3 by 0.25—0.3 mm. Vexillary stamen 4—6 mm long. Filaments alternately longer and shorter, respectively 5—8 mm and 4—7.5 mm long, up to 2/3 connate. Anthers c. 0.3 mm long, uniform. Nectary lobes connate into an open ring round the stipe, glabrous. Ovary strigose, 3—4 by 0.5—0.75 mm. Ovules 2—4, medial. Style glabrous, 2—3 mm long. Stigma capitate. Pod 7.5—9.5 by 1.5—2 cm. Seed 1 by 0.5 cm.

DISTRIBUTION: China (S. Yunnan).

HABITAT: Altitude 1370—1525 m.

FIELD NOTES: A large climber. Flowers white.

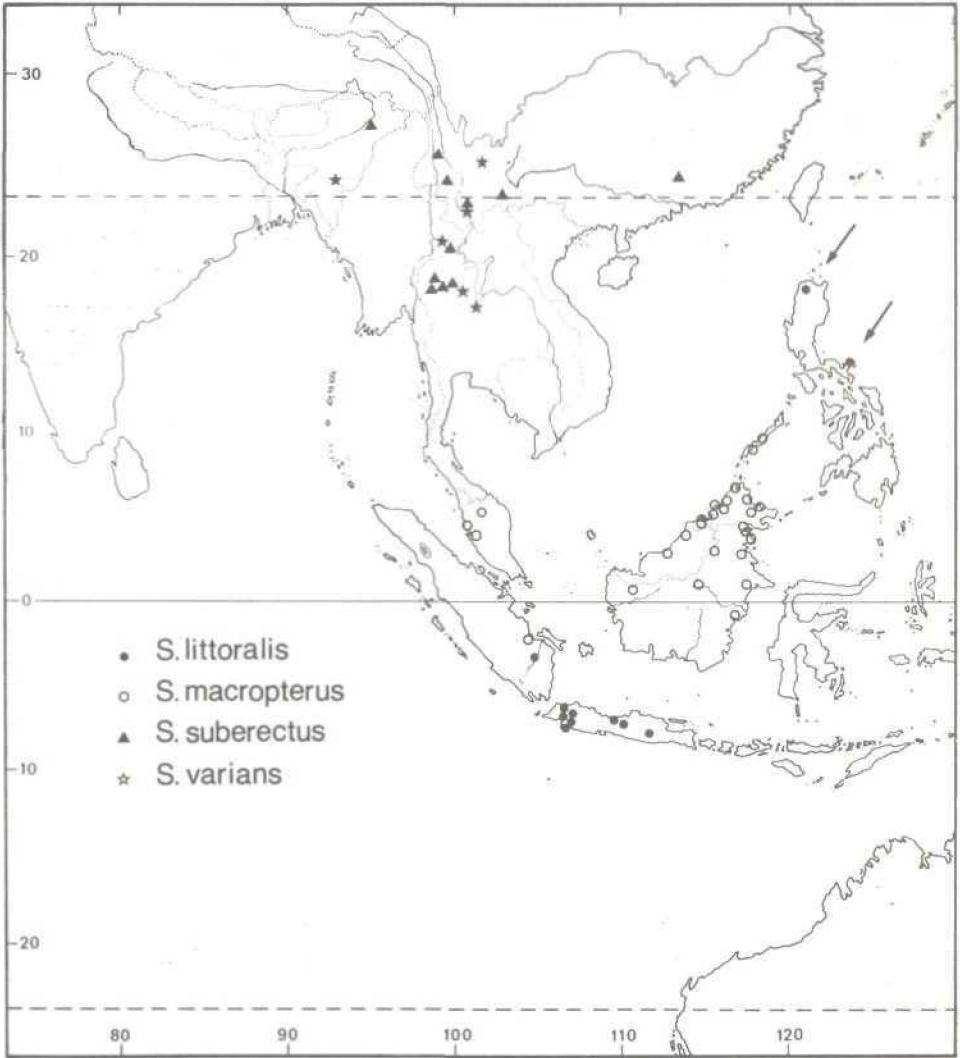
NOTES: 1. *S. pulcher* is a densely hirsute plant, with relatively large flowers in dense panicles. It resembles *S. varians* in the leaflets and pods. The same type of nectary is found in *S. suberectus*. These two species are also from Yunnan. The calyx is of the same type as the calyx of *S. parviflorus*, with narrow calyx lobes as long as the cup and a glabrous groove at either side of the vexillary lobe.

2. The number of ovules varies from 2—4, but is usually more than 2 per ovary. Maybe this is an indication to the relationship with *Rutea*.

SPATHOLOBUS PURPUREUS Benth. ex Prain

S. purpureus Benth. ex Prain in J. As. Soc. Beng. 66 (1897) 414; Baker in Hook. f., Fl. Br. Ind. 2 (1879) 194. — *Butea purpurea* (Benth. ex Prain) Blatter in J. Ind. Soc. 8 (1929) 137. — TYPE: *Stocks s.n.* (Canara) (n.v.), Talbot 1630 (K, CAL), in fruit.

Indument puberulous, yellow brown. Stipules caducous, not seen. Rachis 5—10 cm long, the ultrajugal part 1.2—2 cm long. Pulvinus 6—7 by 2 mm. Stipellae 1—2 by 0.2 mm; caducous. Petiolule 5 by 1.5—2 mm, glabrous. Leaves coriaceous, glabrous. Terminal leaflet



10—20 by 4.5—10 cm, elliptic to narrowly elliptic, base rounded acute to obtuse, apex acute to acuminate. Lateral leaflets with an asymmetric base; acroscopic base rounded acute to obtuse; basiscopic base cordate. Midrib and secondary nerves raised at lower surface. Secondary nerves 6—11 pairs, diffusely ending towards the margin. Venation reticulate. Flowers in fascicles, these arranged in axillary panicles up to 25 cm long; the lateral branches with two bracts, these 3—4 by 0.5—1 mm; the fascicles with one bract, this 2 by 0.2 mm; the flowers with one bract, this 2 by 0.2 mm. Pedicel 2 mm long. Bracteoles 2, inserted just below the calyx 0.5—1 mm long, subadpressed, present when flowering. Calyx puberulous; cup c. 2 mm long and 2 mm in diameter; vexillary lobe one topped, 1 by 2.5 mm; the other three lobes obtuse to acute, 1 by 1 mm. Standard: blade elliptic, 3.5 by 3 mm, base obtuse, apex emarginate; claw 0.5 by 0.5 mm. Wing: blade 3.5 by 1.5 mm, with a small lateral pocket and a row of hairs on the ventral basal margin; claw 1.5 by 0.2 mm. Keel: blade 2.7 by 2.2 mm; claw 1.7 by 0.2 mm. Vexillary stamen 4.5 mm long. Stamens alternately longer and shorter, respectively 5—5.5 and 4.5 mm long, more than 3/4 connate. Anthers c. 0.2 mm, uniform. Nectary 5-lobed, pubescent. Ovary 3 by 0.5 mm, pubescent. Ovules 2, apical. Style glabrous, 2 mm. Stigma minute, flat. Pod 9—10 by 2—2.5 cm, glabrescent.

DISTRIBUTION: W. India.

HABITAT: Evergreen forest. Annual rainfall 5000 mm. Altitude 500 m.

FIELD NOTES: Lofty climber.

NOTES: 1. *S. purpureus* has the same type of leaflets as *S. acuminatus*. The pod is narrowly winged and glabrous. The inflorescence is very dense and fasciculate. The corolla is dark purple according to Baker and Prain. The dark coloured spots in the basal half of the calyx are very remarkable. As is *S. ridleyi* and *S. macropterus* there is pubescence on the nectary, which is 5-lobed. The apical place of the ovules is also striking.

2. See also notes on: *S. acuminatus*.

SPATHOLOBUS RIDLEYI Prain ex King

S. ridleyi Prain ex King in J. As. Soc. Beng. 66, II (1897) 80; Ridl., Fl. Mal. Pen. 1 (1922) 575. — *Butea ridleyi* (Prain ex King) Blatter in J. Ind. Soc. 8 (1929) 137. — TYPE: *Ridley 6401* (K, SAR).

Indument puberulous. Stipules caducous, 4—5 by 1—2 mm. Rachis 3—4.5 cm long, the ultrajugal part 1—1.5 cm long. Pulvinus 3 by 1 mm. Stipellae caducous, 2—4 mm long. Petiolule 3—4 by 1 mm minutely puberulous. Leaves coriaceous, upper surface glabrous, lower surface puberulous (lens!). Terminal leaflet 7—7.5 by 2.5—3 cm, narrowly elliptic, base rounded to acute, apex acuminate-acute, mucronate. Lateral

leaflets symmetric. Midrib raised at lower surface. Secondary nerves 7—8 pairs, forming indistinct marginal arches. Venation reticulate. Flowers arranged solitary in panicles up to 9 cm long; the lateral branches with one bract, not seen; flowers with one bract, this 1.5—2 by 0.3 mm. Pedicel 1.5 mm long. Bracteoles 2, inserted just below the calyx, 0.5—1 mm long, spreading. Calyx puberulous; cup 2.5 mm long and 2 mm in diameter; vexillary lobe one topped, 0.7 by 2 mm; the other 3 lobes obtuse, 0.7 by 0.5 mm. Standard: blade orbicular, 4 by 4.5 mm, base truncate, apex emarginate; claw 1.5 by 0.2 mm. Wing: blade 4 by 2 mm, with a lateral pocket; claw 2.5 by 0.2 mm. Keel: blade 3.5 mm, with a lateral pocket; claw 3 by 0.2 mm. Vexillary stamen 5.5 mm long. Stamens alternately longer and shorter, respectively 6.5 and 6 mm long, up to about $\frac{3}{4}$ connate. Anthers 0.2 mm, uniform. Nectary 10-lobed, pubescent. Ovary 3.5 by 0.5 mm, pubescent. Ovules 2, basal. Style, 3 mm long, glabrous. Stigma minute, flattened. Pod 7.5—9 by 2—2.5 cm, puberulous. Seed 12 by 7 mm.

DISTRIBUTION: Only known from the botanic garden in Singapore.

FIELD NOTES: Flowers white.

NOTES: 1. Characteristic for this species is the midrib which is very much raised of the lower surface of the narrow leaflets. The flowers resemble those of *S. acuminatus* and *S. harmandii* in calyx, shape of petals and the small uniform anthers. *S. ridleyi*, however, has a pubescent nectary as *S. macropterus*. Also in the pod it resembles this species.

2. See also notes on: *S. albus* and *S. pupureus*.

SPATHOLOBUS SUBERECTUS Dunn

S. suberectus Dunn in J. Linn. Soc. Bot. 35 (1903) 489; *Butea suberecta* (Dunn) Blatter in J. Ind. Soc. 8 (1929) 138. — TYPE: *Henry 11, 997A* (K, lecto-), (L, E, iso-).

S. floribundus Craib in Kew Bull. 1927, 64; Craib, Fl. Siam. Enum. 1 (1928) 446. — TYPE: *Kerr 1826* (K).

S. laoticus Gagnep. in Lecomte, Not. Syst. 2 (1911) 369; Thuan, Fl. Camb. Laor & Vietnam 17 (1979) 103—104; Gagnep., Fl. Gen. I-C. 2 (1916) 445; *Butea laoticus* (Gagnep.) Blatter in J. Ind. Soc. 8 (1929) 136 — TYPE: *Spire 453* (P).

Indument strigose. Stipules early caducous, 5 by 2 mm. Rachis 5.5—17.5 cm long, the ultrajugal part 1—4 cm long. Pulvinus 5—12 by 1.5—4 mm. Stipellae caducous, 2—7 by 0.25—0.5 mm. Petiolule 5—10 by 1—2 mm minutely puberulous. Leaves chartaceous, upper surface sparsely strigose, lower surface glabrous. Terminal leaflet 6—22 by 3.5—12 cm, elliptic to elliptic-ovate, base acute, apex acuminate to caudate. Lateral leaflets asymmetric; acroscopic side elliptic to narrow-elliptic, base acute, apex acuminate; basiscopic side ovate, base acute to obtuse, apex acute to acuminate. Midrib and secondary nerves raised

at lower surface. Secondary nerves 7—10 pairs, forming marginal arches. Venation scalariform. Flowers in fascicles, these arranged in axillary or terminally panicles, up to 22 cm long; the lateral branches with two bracts these early caducous; the fascicles with one bract, this 1.5 by 0.5 mm and one bract per flower, this 1 by 0.2 mm. Pedicel 1—2 mm long, inserted just below the calyx, adpressed, persistent when flowering. Calyx puberulous inside; cup 2—4 mm long and 2—3.5 mm in diameter; vexillary lobe one or two topped, 0.75—1.5 by 2—3 mm; the other 3 lobes obtuse, 0.5—1 by 1—1.3 mm. Standard: blade 4—7 by 3—6 mm, nearly orbicular, base obtuse to decurrent, apex emarginate; claw 1—1.5 by 0.5 mm. Wing: blade 2—5 by 1.75—2.25 mm, with a dorsal auricle and a small lateral pocket; claw 0.5—2 by 0.5 mm. Keel: 1.5—4 by 1.25—2 mm, with a small dorsal auricle and sometimes a small lateral pocket, the connection of the two blades is rather loose; claw 0.5—2.5 by 0.5 mm. Vexillary stamen 2—4.5 mm long. Filaments alternately longer and shorter, respectively 2.5—6 and 2—5 mm long, up to 2/3 connate. Anthers 0.25—0.3 mm, round; the shorter filaments with smaller anthers. Nectary lobes in a connate ring round the stipe, glabrous. Ovary pubescent, 1.5—3 by 0.5—0.75 mm. Ovules 2, basal or medial. Styles glabrous, 2.5—3 mm. Stigma flattened or capitate. Pod 6.5—10 by 2—3.3 cm. Seed 17 by 8 mm.

DISTRIBUTION: N. Thailand, S. China.

HABITAT: Common in evergreen forest. Altitude 1250—2100 m.

FIELD NOTES: Large climber, up to 15 m. Flowers white or pale yellow, flushed pink at the base, scented.

NOTES: 1. In dried state recognizable by the glabrous lower surface of the leaflets, which seem nacreous by the slightly sunken venation and the strongly asymmetric lateral leaflets.

2. According to Dunn *S. suberectus* resembles *S. parviflorus*, 'from which it can be distinguished by its different calyx teeth and by the tufts in the vein-axils of the leaves'. *S. suberectus* is different in more characters e.g. in the connate nectary. The leaflets of both species are strongly asymmetric, but the nervation is different. Craib states that *S. floribundus* differs from *S. suberectus* in having 'keel and wing-petals not at all conspicuously auriculate'. In our opinion this is a gradual difference within the variability of the species. *S. laoticus* is in our view also conspecific.

3. See also notes on: *S. acuminatus*, *S. pulcher*, and *S. varians*.

SPATHOLOBUS VARIANS Dunn

S. varians Dunn in J. Linn. Soc. 35 (1903) 420. — *Butea varians* (Dunn) Blatter in J. Ind. Soc. 8 (1929) 138. — TYPE: Henry 11771A (K, L, E, lecto-), Henry 11771B (K, E, syn-), Henry 11771C (K, syn-).

S. dimorphus Craib in Kew Bull. 1927, 63; Craib, Fl. Siam. Enum. 1 (1928) 446. — TYPE: *Kerr 8744* (K, SING, lecto-), *Kerr 8744A* (K, syn-).

Indument strigose. Stipules caducous, 12 by 5 mm. Rachis 5.3–22 cm long, the ultrajugal part 1.2–5.3 cm long. Pulvinus 5–8 by 2–4 mm. Stipellae caducous, 4–11 by 0.5–1 mm, longer than petiolule. Petiolule 4–7 by 1–3 mm sparsely sericeous. Leaves chartaceous or coriaceous, glabrescent; young leaves strigose. Terminal leaflets 8.5–17 by 4–8.5 cm, elliptic to obovate, base acute, apex round or acute, the very apex abruptly acuminate and mucronate respectively only mucronate. Lateral leaflets slightly asymmetric; acroscopic side narrowly ovate to narrowly elliptic-ovate, base acute, apex round or acute, the very apex respectively abruptly acuminate and mucronate and only mucronate; basiscopic side ovate to elliptic-ovate, base acute, apex round or acute, the very apex respectively abruptly acuminate and mucronate and only mucronate. Midrib and secondary nerves raised at lower surface. Secondary nerves 7–11 pairs, forming marginal arches. Venation reticulate-scalariform. Flowers arranged solitary on short branches, these up to 2 cm long and arranged in axillary or terminal panicles up to 20 cm long; the lateral branches with two bracts, these 3 by 1.5 mm; the flower bearing branches with one bract, this 4 by 1 mm; the flowers with one bract, which in very early caducous and 2–3 by 1 mm. Pedicel 1–3 mm long. Bracteoles 2, inserted just below the calyx, 1–1.5 mm long, subadpressed. Calyx puberulous; cup 3–3.5 mm long and 2–2.5 mm in diameter; the vexillary lobe one or two topped, 2–3 by 0.8–3 mm, the other 3 lobes acute to rhomboid, 2–3 by 1–1.3 mm. Standard: blade elliptic, 4–6 by 5–7 mm, base obtuse to decurrent, apex emarginate; claw 1–2 by 0.3–1 mm. Wing: blade 3–5 by 2 mm, with a lateral pocket and a few hairs on the ventral basal part and sometimes on the dorsal basal margin; claw 2–4 by 0.3–0.5 mm. Keel: blade 3–3.5 by 2 mm, with a lateral pocket; claw 3–4.5 by 0.3–0.5 mm. Vexillary stamen 3–5 mm long. Stamens alternately longer and shorter, respectively 4.5–8 and 4–7 mm long, up to 2/3 connate. Anther alternately 0.3–0.5 mm long and reduced. Nectary 10 lobed or indistinct, glabrous. Ovary 2–4 by 0.5–0.7 mm, pubescent. Ovules 2, medial or apical. Style, 2–4 mm long, glabrous. Stigma capitate. Pod 6.5–9 by 1.5–2 cm, brown puberulous. Seed 25 by 10 mm.

DISTRIBUTION: E. India, Burma, Thailand, SE. China.

HABITAT: Evergreen forest. Altitude up to c. 1600 m.

FIELD NOTES: Large woody climber. Flowers purple or deep crimson.

NOTES: 1. *S. varians* resembles *S. suberectus* very much in flower and leaflets, but the apex of the leaflets is blunt, the flowers are not arranged in fascicles, the anthers are upper surface glabrous, lower surface puberulous. Terminal leaflet elliptic, 8–17 by 5–10 cm, base obtuse to rounded emarginate, alternately reduced, and the nectary is

connate. Dunn states that it only differs from *S. acuminatus* in the leaf-venation and in having smaller stipels. Other differences are found in e.g. the shape of calyx and petals and in the reduction of the anthers. *S. dimorphus* is in our view conspecific with *S. varians*.

2. See also notes on *S. acuminatus* and *S. pulcher*.

***Spatholobus viridis* WIRIADINATA & RIDDER-NUMAN, spec. nov.**

Stipulae mox deciduae. Folia subtus puberula, costa nervis secundariisque prominentibus, 10—14 paribus arcibus marginalibus distincte compositis; foliolo terminali elliptico, basi obtuso ad rotundata emarginato, apice (abrupte) acuminato, foliolis lateralibus fere symmetricis. Inflorescentia pseudo-paniculata. Bracteoli 0.5—1 mm sub calyce inserti. Calyx puberulus, tubo 2—3 mm longo, 1.5 mm in diametro, lobis 0.5 mm longis, acutis, lobo vexillari paulo emarginato. Antherae uniformes, 0.3—0.5 mm longae. Nectarium 10 lobato, glabro. — TYPE: A 1038 (Austin Cuandra) (BO-holo, K).

Indument puberulous. Stipules caducous, 7 by 3 mm. Rachis (2—) 4—9 cm long, the ultrajugal part 1—3 cm long. Pulvinus 6—8 by 3—5 mm. Stipellae caducous, about 6 mm long. Petiolule 5—15 by 1—2 mm, pubescent. Leaves chartaceous to coriaceous, upper surface glabrous, lower surface puberulous. Terminal leaflets elliptic, 8—17 by 5—10 cm, base obtuse to rounded emarginate, apex (abruptly) acuminate. Lateral leaflets more or less symmetric. Midrib and secondary nerves raised at lower surface. Secondary nerves 10—14 pairs, forming distinct marginal arches. Venation reticulate. Flowers arranged in fascicles, these arranged in terminally or axillary panicles; in terminally panicles the lateral branches often with a trifoliate bract; the lateral branches with two bracts, these 2 by 1 mm; the fascicles with one bract, this 2 mm long; the flowers with one bract, this 0.8 mm long. Pedicel up to 2 mm long. Bracteoles 2, inserted 0.5—1 mm below the calyx. Calyx puberulous; calyx cup 2—3 mm long and about 1.5 mm in diameter; vexillary lobe slightly two topped, sometimes not emarginate, 1.5—2 by 0.5 mm; the other lobes acute, 1 by 0.5 mm. Standard: blade nearly orbicular, 3—4 by 4—4.5 mm, base decurrent, apex emarginate; claw 0.5—1.5 by 0.5 mm. Wing: blade 2.5—3.5 by 1—2 mm, with a lateral pocket and a very small but distinct ventral auricle and sometimes a dorsal auricle; claw 1—2 by 0.2 mm. Keel: blade 2—2.5 by 1—1.5 mm, with a lateral pocket; claw 1—2 by 0.2 mm. Vexillary stamen 3—5 mm long. Stamens alternately longer and shorter, respectively 4—5.5 and 3.5—5 mm long, connate up to 3/4. Anthers ca. 0.3—0.5 mm long, uniform. Nectary 10 lobed, glabrous. Ovary 2—2.5 by 0.5 mm, densely pubescent. Ovules 2, medial. Style 2—4 mm long, glabrous. Stigma minute and capitate or flattened and oblique. Pod not seen.

DISTRIBUTION: NE. Borneo. Sabah (9 Coll.): Sarawak, Serian (*S. 15208*); E. Kutei (*Kostermans 21654*).

HABITAT: Primary forest, along ridges; secondary forest, Sandy soil. Altitude up to 335 m.

FIELD NOTES: Woody climber, shrub or treelet up to 7 m high, diameter 20 cm. Trunk light pale; bark brownish producing red latex. Flowers white, whitish, light green or palish at top, reddish at bottom.

NOTES: 1. *S. viridis* has the same kind or regularly nerved, minutely puberulous leaflets as *S. latistipulus*. The stipules, however, are caducous and narrowly triangular. The flowers resemble those of *S. albus*, but the nectary is not pubescent.

DUBIUS NAME

SPATHOLOBUS RIPARIUS Prain

S. riparius Prain in J. As. Soc. Beng. 662 (1897) 416. — **TYPE:** *Gallatly* 824 (number not indicated in the original description) (Taepo), *Kurz* 1709 (n.v.).

Original description: "Leaflets thick, very rigid, obovate, obtuse, cuneate at base, lateral slightly obliquely, glabrous above, sparsely shortly puberulous on the nerves beneath, flowers small, calyx obscurely downy, upper and lower teeth oblong, lateral" triangular, nearly as long as the tube, pod sessile narrowed to the tip."

Tenasserim; on Taepo, 5000 ft. *Gallatly*! Pegu; on Tounkyeghat, *Kurz* n. 1709!

A low spreading tree (fide *Gallatly*) hanging over streams. Leaflets very rigid but not so thick as those of *S. crassifolius*, with 6—8 pairs of almost straight, oblique lateral nerves much raised on both surfaces, cross reticulations beneath very distinct; shining above, dull beneath. Panicles a foot long, pedicels shorter than calyx. Calyx 2.5 mm. Corolla pink 5 mm long, limb, of standard hardly as broad as long, emarginate across below, 7.5 mm wide at thickened apex.

S. riparius is included as a nomen dubium because we have seen only very scarce material of type (*Gallatly* 824), containing only unripe pods with some flower fragrances. Maybe it turns out be *S. acuminatus*: the inflorescence seems to be a panicle, the anthers are small (c. 0.2 mm), the calyx cup is puberulous at the outside, the lobes obtuse, the wing and keel petals have no dorsal auricle, and the pod has about the same form and measurement (7—8.5 by 1.5—2 cm).

EXCLUDED SPECIES

Spatholobus africanus Baker in Oliver, Fl. Trop. Afr. 2 (1871) 188 = *Leptoderris brachyptera* (Benth.) Dunn (cf. Hutchinson & Dalziel, in Fl. W. Trop. Afr. 1, 2 (1958) 521).

IDENTIFICATION LIST OF SPATHOLOBUS (LEGUMINOSAE)

acum	=	acuminatus	macr	=	macropterus
alb	=	albus	main	=	maingayi
auric	=	auricomus	merg	=	merguensis
aurit	=	auritus	mult	=	multiflorus
brac	=	bracteolatus	obl	=	oblongifolius
cras	=	crassifolius	pall	=	pallidus
dub	=	dubius	parv	=	parviflorus
fer	=	ferrugineus	pers	=	persicinus
fera	=	var. acutus	pott	=	pottingeri
fers	=	var. sericophyllus	pul	=	pulcher
gyr	=	gyrocarpus	purp	=	purpureus
harm	=	harmandii	ridl	=	ridleyi
hirs	=	hirsutus	rip	=	riparius
lat	=	latistipulus	sub	=	suberectus
litt	=	littoralis	var	=	varians
			vir	=	viridis

Achmad 341: fer — Ahern's collector, see F.B. — d'Alleizette 1799: parv — Andjah 141: gyr — Anderson 28: parv — Aposol BNB 7206: fer.

Backer 1700 bis, 10075: fer; 10099, 11016: litt; 14759: fer; 16269: litt; 16961: fer; 17061: litt; 17062, 17156, 17245: fer; 17276: litt; 17437, 25785: fer — Bakhuizen van den Brink Sr 8002: fer — Bakhuizen van den Brink Jr 3105 (or 3103): fer — Balakrishnan & Bhargawa 3463: acum — Balansa 3141: pott — van Balgooy 3652, 3977: fer — Barber 1364: parv — Beccari (all P.B.) 1108, 2087, 2723, 2990: main; 3100: fera — Bejaud 7: parv — Bell 7876: parv — van Beusekom c.s. 2542, 3607: parv — B.K.F. series (Bangkok Forest Herbarium) 962 (Flora of Thailand), 16551 (Phloenchit 1306), 35963 (Bunchai 1595), 37778 (Suvarnakoes 2036), 37911 (Phengkhlai 17): parv — B.N.B. series (British North Borneo Forestry, Department) 1300: fer; 2412: gyr — Boden Kloss 14808: fer — Bor 5067: sub — Bourne 881, 3405: parv — Brooke 10285: gyr — BRUN series (Forest Department Brunei) — B.S. series (Bureau of Science, Manila) 1046: fera; 2630: main; 2775, 8268, 22966: gyr; 28217, 30947: litt — Buchanan 172: parv — Burek 1904: fer — Burkill & Haniff 13840: main; 17548: gyr — Burot Ho 1895: macr. — Castro & Melegrito 1679: gyr — Celestino & Ramos PNH 23077: macr — Chew Wee Lek 1081: gyr — Chin See Chung 2655: obl — Chun, S.H. 4320, 4721: harm — Clarke 14981: cras; 16908: parv — Clemens

3742, 3824: acum; 26354: obl; 26462: marc; 26963 (= 30224), 30236: obl; 40427: macr — Collins 536, 1635, 1827, 1994: harm — Cuadra NBFD A 894: obl; A 1017, 1038: vir; A 1044, A 1137, A 1139: macr — Cuming 945: gyr — Curtis 271: fer; 2970: dub.

Derry 1203: fer — Dickason 6681: parv.

Elmer 9337: gyr; 11793: main; 13063: macr; main 13300: main; 17560: gyr; 17642: main; 17984, 18250: gyr; 20284: fer; 21175, 21298, 21390, 21398: macr; 21439: lat; 21562: macr — Elsener H88: fer; H141: litt — Endert 5162: hirs; 5410: pers — Evrard 432: parv.

F.B. series (Forestry Bureau, Manila) 464: gyr; 466: main; 1149, 2957: gyr; 21324: main?; 21474: main; 21600: macr; 26055: main?; 26840: gyr; 26841: main — Forbes 3243: macr — Forrest 8276, 8507, 9392: sub; 12251: var; 13627: acum — Franck 56: acum — F.R.I. series (Forest Research Institute, Kepong) 4116: fer; 6530: macr; 8373: main; 8430: main; 10529: macr; 10604: gyr — Fuchs 21292: macr.

Gallatly 171: parv; 824: rip — Gamble 2229A, 2230A, 8701, 12897: parv — Garret 1353, 1356: parv — Geesink & Phengkhilai 6068: parv — Goodenough 1437: fer — Greshhoff 171: fer — Griffith 1487: fer; 1678: acum; 1682, 1683, 1684 (K.D.): parv; 1826 (K.D.): cras; 1843: cras.

Haines 686, 2615, 3013: parv — Hallier 1382: fer — Haniff 3703: aurit — Harekh 21525: parv — Harmand 42: harm; 524, 4842: parv — Haviland 526: fer; 1974, 2897: main — Haviland & Hose 3276: pers; 3278, 3617, 361k: fer — Heinig 250: acum — Helfer 1685: parv; K.D. 1825: barc — Henderson SF 21917: main; SF 23060: harm — Henry, B.C. 31, 44: harm; 325: pul — Henry, A. 11242: sub; 11771, 11771A, 11771B, 11771C, 11771D: var; 11977, 11977A, 11977B: sub; 12780, 12780A, 12780B, 13331: pul; 13698: sub — Hohenacker 1847: parv — Hort. Bg. 47, XII.A.117 & a, XII.A.125: fer; XVII.E.75: main XVIII.D.23: parv; XVIII.C.25, XVIII.C.27: fer — Hose 441, 486, 632: obl — How, F.C. 71016, 72999, 73490, 73495: harm — Hullett 211: fer.

Iboet 541: fer.

Jacquemont 694: parv — Junghuhn 259: litt; 262, 263: fer.

Keith NBFD 9095: macr — Kerr 423: parv; 1826, 1826A, 5435: sub; 8744, 8744a, 8744b: var; 9026: parv; 9167: harm; 12317: pall; 15033, 18291: acum; 20485: parv — Kiah 24368: litt — King 98: acum — King's collector, see Kunstler — Kokawa & Hotta 1487: macr — Koorders 24241, 31187: fer — Kostermans 49A: fer; 1171: parv; 6186: lat; 6586: main; 6842, 7076: macr; 7108: pers; 13652: macr; 13688: obl; 21244: gyr; 21654: vir — Kunstler 3, 486: parv; 3181: gyr; 3366:

fer; 3535: main; 3566: fer; 4652: main; 6862: fer; 6906: main; 7585: dub; 7770: gyr; 7904: fer; 8079: brac; 8182, 10390: gyr; 10428: main; 10458: gyr — Kurz 1709: rip; 2596: acum.

Lace 2730: parv; 2788, 2950, 3033, 4723: acum; 5395, 6206, 6285: parv — Lakshnakara 953, 1030: parv — Lambach 1347: fer — Langlasse 68: fer; 207?: acum — Larsen c.s. 31677, 31816: parv — Lei 80, 88: harm — Leighton 549: macr — Lemann 363: cras — Lister 98: acum?; 293, 323: acum — Loher 5043: gyr.

MacGregor 1274: var — Maidin 7331: mult — Maingay (K.D.) 530: fer; 611: acum — Marcan 1794: parv — Martin 421: parv — Maung To Chin 5720: acum — Maxwell 74-746: parv: 75-127, 75-197: acum; 75-403, 75-555: parv — Merrill 2685: gyr — Meijer 2508: macr — Monod de Froideville 70: fer — Motley 24: fer; 734: pers; 749: litt — Moulton 26: gyr.

Native collector 690: fer — van Niel 4397: fer.
van Ooststroom 12564: fer.

Parish 283: parv — Parkinson 393: acum; 1690: merg — Phengkklai c.s. 2962, 3169: parv — Phytochem. Survey 2758: gyr — Pierre 995, 1883: parv; 7837: harm — Poilane 775: harm; 11109: acum; 11460; 11856: harm; 14222: parv; 14573: acum; 15432, 15870: sub; 16391, 17967, 18545: parv; 19800: harm; 20341, 20366: pott; 21490: parv; 25440: sub; 25459: pott; 25549: sub; 20016, 30618, 32375: parv — Poore 888, 1179: fer — Prain's collector 13: acum — Proudlock 15: merg — Puara BNB 703: macr; NBNFD 4880: mult — Purseglove 5529: fera — Put 58: parv; 1504: acum; 4062: parv.

Rahmat si Boeea 7992: main — Richards 2542: fer — Ridley 3609, 3609d, 4673: fer; 5578, 6394: fers; 6397: main; 6401: Ridl; 10703: gyr; 11376, 12521: main; 14808: fer — Robertson 391: parv — Rock 631: parv; 1781: sub; 2698: pul — R.R.I. (Rubber Research Institute, Malaya) 38: gyr — Rudd 3062: parv — Rutten 84: macr.

S series (Sarawak Forest Department, Kuching) 15208: vir; 15843, 16511: fer; 22446, 22517, 23063: auric; 23683: alb; 23879: macr; 28424: fer; 31745: macr; 32206: alb; 32272: macr; 32363: alb; 32370: mult; 32829: macr; 35021, 37475: fer — SAN series (Forestry Department, Sandakan, Sabah) 15220, 15241, 16421: macr; 16690: obl; 17578, 18841: macr; 19832: obl; 19885, 22197, 22567: macr; 26771: ?macr; 26779: pers; 26797: macr; 27454: obl; 30594: main; 30919: fer; 31112: vir; 31253, 31293: macr; 31372: gir; 32504: gyr; 32978: macr; 34322: main; 35714: vir; 37113: macr; 37132: hirs; 38385: fer; 40556: macr; 42028:

fer; 42494: macr; 43060, 43937: obl; 48578, 49853: vir; 50155: main; 50315: macr; 50481: obl; 50484: main; 50966: mult; 54894: gyr; 55708 (?55908): obl; 59269: obl; 60931: macr; 60939: vir; 61183: fer; 64463: obl; 65877: lat; 65944: obl; 66164, 66230: macr; 66270: vir; 67684: macr; 68496: main; 72497: mult; 74457: gyr; 75571: fer; 76900: main; 76943: macr; 76946: main; 77125, 77386, 77576: macr; 77623, 77856: gyr; 79165: macr; 83595: gyr; 83947: macr; 84651: fer; 85878: main; 86799: fer; 87854: gyr; 88141, 88828: macr; 88852: gyr — Sangkhachad 238: harm — Santos 4064: main — Schiffner 2188: fer — Schmid 717: parv — Scortechini 206: main; 213, 1466: fer; 1537: main — Sedgwick 1099?: purp — Shah & Noor 2043: fer — Sharma, Y.D. 47: parv — Sinclair SF 40687: fer — Soepadmo 881: fer — Spire 245, 275: var; 353: parv; 453: var; 1067: pott — Stone 11461: fer — Sulit ONH 12513: fer.

Talbot 1630, 4401: purp — Thakur Rup Chan 6853A: var — Rhomson 886: parv — Tsang, Wai-Tak 288: harm — Tsui, T.M. 381: sub.

U Thein Win 143: parv.

Valera NBFD 4697: macr — Vanpruk 680: fer — Vidal 243, 1302: main; 2359: parv; 2652: main — de Vogel 2290: macr.

Walker 1331: parv — Wallich 5440: acum (partly parv); 5440D: parv; 5442: parv (Partly gyr); 5443, 5907: acum; 5913: cras; 8082, 9054: acum — Wang, C. 37016: harm — Warburg 12106: gyr — Wenzel 841: litt?; 989: gyr — herb. Woght 244, 745, 914: parv — de Wilde & Wilde-Duyffjes 14424: fer — Williams & Stainton 8535: parv — Winckel 325B, 480B: litt; 493B: fer — Winit 1427: sub — Winkler 164: fer — Wirawan 345: fer — Wray 1270: main; 1941, 2008, 2381, 3250.

Yu, T.T. 16373: sub.

Zolinger 3148: fer.

Additional specimen examined:

Backer 1280, 17027: fer; 33050: litt; 41098, 41099, 41603, 41604, 41605, 41646: fer — Bakhuizen van den Brink Jr 6106, 8002: fer — BNB 7206: fer — Boden Klaus 29. X. 1924: fer — Cramer 153, 154: fer — Docters van Leeuwen 9. XII. 1923: litt — Elmer 11795: main — Hallier 22. II. 1896: fer — Hort. Bg. XVII. E. 87, XVIII. C. 26—26a: litt — Iboet 541: fer — Lorzing 3982: fer — Nieuwenhuis 1317, 1440, 1444: hirs — van Steenis 5691, 8221, 11212, 12690: fer — Teijsman 8316: fer — de Voogd 526: litt — Voordeman 6600: fer — Winckel 467, 488: litt; 493: fer — Wiriadinata 858: fer — Yates 2158: main.

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